Municipal Winter Trail Design Standards: Includes a Winter Trail Design Standards GIS Analysis of the City of Prince George City Wide Trail System Master Plan

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Abstract

Many cities in Canada have trail systems that provide recreational and commuting opportunities for their residents and visitors but have not developed or maintained their municipal trail system for winter snow-based trail activities. Trail standards exist for many types of trails, uses and environments but an integration of standards for winter recreational activities with that of municipal seasonal trail standards currently in use is necessary to encourage planning, design and maintenance of winter trails at the community level.

Using a mixed-methods approach, research was conducted through a focused synthesis, questionnaires and a focus group towards developing an understanding of the existing level of winter trail planning knowledge and determining what the issues and desires of trail users are in regards to municipal winter trails. The results showed that very good standards exist for winter snow-based recreational activities, there is a strong desire for winter trails at the municipal level for both recreational and utilitarian purposes and that existing municipal multi-use trail standards only require maintenance to allow for snow-based trail activities. A GIS analysis of the City of Prince George was then conducted to illustrate the recommended winter trail standards from this research that can be used as part of the planning process to aid in the development of a winter trail system at the municipal level.

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Acknowledgements

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1.0 Project Description

This project will examine existing trail design standards for snow-based winter recreational activities, explore public and stakeholder desires regarding winter trail design and development, and investigate the matching of such standards and desires with that of existing municipal trail design criteria used in winter cities. It is hoped that this research will result in detailed recommendations that can then be used towards the creation of municipal winter trail design standards.

Four research methods will be used for this project including:

- Focused synthesis of the literature
- Trails Task Force Focus Group
- Public Questionnaire
- Public Open house

To illustrate the recommendations made in the project, mapping will be generated from a GIS analysis of the existing and proposed trails from the City of Prince George City Wide Trail System Master Plan.

It needs to be noted that since trails are utilized during the winter months and, depending on location, may or may not have a snow base on the trail for a significant period of time, the term 'winter trail' could be used for all trails that are utilized during the winter months of the year. Since the definition of a Winter City is well understood in the literature as a

community which experiences both snowfall and below freezing average temperatures for at least two consecutive months, the definition of a municipal 'winter trail' can be defined in a similar context (Pressman, 1995). Although municipalities vary in their topography, microclimates, vegetation, orientation to the sun, and prevailing winds, a trail that is to be utilized in the winter for snow-based activities still requires below freezing temperatures and snowfall to permit these activities to take place for extended periods. In consideration of the above, the following will define a municipal winter trail in this research from this point forward.

Figure 1 - Definition of a Municipal Winter Trail

A 'municipal winter trail' is a formally recognized trail, either maintained or unmaintained, within the boundaries of a winter city that allows opportunities for snow-based recreation or transportation activities to take place by residents and visitors.

1.1 Research Context

Much of the trail related research to date has focused on the development and economic impact of *seasonal* multi-use trail systems at the municipal and regional level, i.e. spring, summer and fall (Seward, 2001; Lane, 1999; Moore & Barthlow, 1998). The creation of a good leisure opportunity for residents and visitors has been the practical consequence of such

research and is desired in multi-use trail planning (Flink et al, 2001). Unfortunately, such research is most often conducted on trail systems during the snow-free months of the year, or has been undertaken in regions that do not receive snow (Flink et al, 2001; Lanarc Consultants, 1995). For this reason, information was sought that was not only municipality focused but also specific to snow covered trail systems, plans, designs and standards for areas located outside of municipalities. As none of the major trail publications, government trail standards, or municipal trail plans identified literature or sources of information from outside Canada or the United States, the scope of this research was limited to these countries.

Another element to this research that bears mentioning is the motorized use that occurs on some trails. Many back country trails are utilized for both motorized and non-motorized forms of winter recreation, especially in northern British Columbia (Outdoor Recreation Council of BC, 2000; Seguire, 1986; Trails BC & Outdoor Recreation Council of BC, 2000). Some winter wilderness trails in British Columbia have been designated for non-motorized use, such as for snowshoeing and skiing, while others have been developed for the sole purpose of snowmobiling (Trails BC & Outdoor Recreation Council of BC, 2000). Community trails, on the other hand, typically prohibit motorized forms of recreation and instead focus upon human powered winter activities during the trail planning process, e.g. trail design, construction, and maintenance (Brockington, 1998). Only two smaller rural communities currently manage for motorized use within their municipal boundaries, Whitehorse, Yukon and Elkford, British Columbia, although several reports have suggested that more inclusive and comprehensive policies for trail planning and construction be undertaken at the community through to the provincial level and that such planning should

consider motorized use in the planning process. For these reasons, this project will focus on non-motorized forms of winter recreation and transportation on community trail systems.

Recently the Province of British Columbia has begun a strategic planning process towards the development of a 'Recreation Trails Strategy' (British Columbia Ministry of Tourism, Sport & the Arts, 2008). This process includes discussions with First Nations, several non-motorized and motorized trail stakeholders, and government ministries who have an interest in the protection of recreational trail use in the province (2008). As stated in the government's Recreation Trails Strategy Phase I Background Report (2008), public recreational use of trails is growing significantly but so are conflicts in their multiple-use. Perception by the public is that the lack of management and planning by government may be at least partially to blame for the threats to the sustainability of a network of trails in BC (2008). As municipal trail systems make up approximately 1/3 of all managed recreational trails in the province, municipal development standards, trail connectivity, and management will all play a major part in the creation of a provincial trails strategy (2008). Aside from community benefits, this project may, therefore, also help to inform the provincial process in regards to acceptable use and design standards specifically for winter trails at the municipal level.

For most communities the framework, policies and design guidelines for developing a municipal trail system are outlined within either a *Trails Master Plan* or *Parks Plan*, with a section on trail planning. Even some small communities have developed trail plans, which itself signifies the importance that residents and the public place on trail recreation, e.g.

Kimberly, Spallumcheem, Whistler. In fact, trail surveys in most of the communities examined clearly link resident quality of life to their desire for more trails in their area (City of Edmonton, 1992; City of Calgary, 2000; Bruyere, 1998; Baker, 2004; Bain, 2004; Michalos, 2005; Russell, 2007). The first goal of the research is to examine existing trail plans, or park plans with a winter trail component, from within a mostly Canadian and Prince George peer community context although it was difficult to find the information initially sought in these areas only; for this reason, the geographic parameters of the focused synthesis had to be expanded to also include a cursory review of some communities in the United States. Even after expanding the search area, only the Lebanon Hills Regional Park Master Plan in Minnesota was determined to be helpful in regards to winter trail planning at a municipal level as the trail plan was for an area immediately adjacent to an urban area, has high levels of use, and attempts to accommodate a variety of winter trail recreational pursuits.

As provincial and federal governments in Canada manage large tracts of Crown land for a multitude of public uses, including recreation, it was not surprising that the Government of Canada and the Province of British Columbia have trail manuals for the planning, development and maintenance of trail systems on those lands (Parks Canada, 1978; British Columbia Ministry of Forests, 2000; British Columbia Ministry of Lands and Parks, 2005). All of these manuals have an extensive discussion regarding appropriate trail design and standards for specific uses, and are, therefore, referenced regularly in other trail planning publications and master plans and throughout this research.

2.0 Focused Synthesis

There were two primary objectives for the examination of the literature regarding winter trails. First, there was a need to better understand the current status of knowledge regarding planning and management of trails for winter recreational activities. What prominent publications are in use by others involved in the planning of trails in Canada? What are the current trail standards for specific winter recreational and sport activities? What are the functional and aesthetic requirements for these winter activities? What maintenance is required to support these winter trail activities? What about the multi-use of trails and the mitigation of user conflicts through land use planning and design?

A second primary objective was to gain more knowledge of the existing status of trail planning, design and development occurring within municipalities in Canada and where winter trails are planned and managed for community residents and visitors. What Canadian communities are managing for multi-season use of their trails, including winter use? Which communities have approved trail plans? What multi-season trail design standards are currently in use at the municipal level in Canada, specifically peer communities to Prince George? What communities and plans have winter trail design standards?

Published articles and books on trail planning could be very useful in meeting these research objectives and identifying the most appropriate design details for winter trail development although it is recognized that there are many trail networks in current operation at the municipal and regional levels that are considered to be very successful facilities even though

they are not discussed in detail within the planning literature; examples include Lebanon Hills, Strathcona County, City of Calgary, City of Whitehorse and the City of Edmonton trail plans. For this reason, municipal and other government land use planning documents related specifically to trail planning, design, management and development were researched as they provide an elevated level of detail as to the existing practice of trail planning, particularly within municipalities, that is not evident in the academic literature.

As several varied sources were consulted in this focused synthesis, and specific themes of trail planning information were pulled together, the creation of headings and subheadings within this focused synthesis section became necessary for clarity purposes; the following is a outline of the focused synthesis section with a brief description provided for each major subsection:

- Government Trail Manuals and Plans. This section includes a review of the three most referenced federal and provincial trail planning documents as well as an extensive assessment of plans and the state of planning for seasonal and winter trails currently in use in several small and large winter communities.
- Trail Design Standards. A discussion regarding land use planning for trails and the trail types most commonly encountered at the municipal level. Includes environmental and wildlife considerations in regards to trails planning.
- Winter Trail Uses. Here a description of the recreational pursuits commonly found on trails in the winter are described with a discussion on the trail standards necessary for the enjoyment of these activities.

- Trail Planning Frameworks. This section describes the planning frameworks that were identified in the literature and which are used in the planning, development and maintenance of trails.

At the end of this review of the literature, a synthesis of the most pertinent information related to municipal winter trail planning is provided. The review and synthesis of this information helped develop the research questions noted in Section 2.6.

2.1 Government Trail Manuals and Plans

2.1.1 Federal and Provincial Government Publications

Parks Canada Trail Manual (1978)

The Environmental Services Division, Engineering and Architecture Branch, Indian and Northern Affairs prepared a *Trails Manual* for Parks Canada in 1978 that today is still referenced in the trail planning literature due to its comprehensive discussion of trail design, development and maintenance for trails within Canada's national parks, e.g. BC Parks Trail Manual, BC Ministry of Forests Recreation Manual, Township of Spallumcheen.

The Parks Canada Trail Manual provides detailed information on both the functional and aesthetic aspects of trail planning depending upon the trail user. Further discussion on the appropriateness of particular structures in certain circumstances, e.g. bridges, surfacing, camping amenities, and the ability of trails to accommodate increasing public demand, using a Carrying Capacity model, is provided within the context of environmental planning and

trail type. User requirements in regards to trail grade, looping, and length are also provided as are appropriate soil conditions and the design of trail structures. Specific design guidelines are provided for cross country ski trails and were considered as part of this research.

BC Parks Trail Manual (1993) and Parks Facility Standards (2005)

In 1993 BC Parks introduced a *Trail Manual* to be used by planners and managers of provincial park Crown lands and has continually updated this manual ever since through a synthesis of information gleaned from many government and non-government publications; it now forms a trails section within the BC Parks Park Facility Standards manual (British Columbia Ministry of Lands and Parks, 2005). This trail information provides detail in the planning, design, construction and maintenance of trails within provincial parks including the inclusion of trail design and construction details. The intent was to provide information on the latest trail design knowledge while also incorporating existing government park management and trail use policy into the trail planning and development regime. Foremost of these planning and management goals is to accommodate trail demand and users while minimizing environmental impact, a Limits of Acceptable Change model (LAC). An additional benefit to such a goal is the reduction in costs associated with the mitigation of environmental degradation brought on because of poor planning or trail design.

This Park Facility Standards provides a trail type classification system (Type I – Type V), on which maintenance standards and permitted usage are based. A Type I trail is the highest standard, with the highest maintenance in order to accommodate the most number of trail

uses whereas, Type V trails have the lowest number of users and thus also the lowest standard and maintenance. This scale of trail types also allows/limits the types of use that can occur on a trail; for example, since a Type I trail is the highest standard it could allow the most number of uses from wheelchair accessibility to equestrian use, skiing, biking and walking depending upon the management plan for that area, but a Type V trail has the lowest standard and maintenance and functions only for more remote backcountry use (2005).

Skiing, snowshoeing and snowmobiling are the winter trail uses identified in the manual and trail design standards are provided for each use. Different types of skiing are supported on different trail types, e.g. racing ski trail, recreational cross country, ski touring/backcountry. Similar standards are espoused for snowshoe trails. Snowmobile trail standards are also provided in this manual, as snowmobiling is permitted in some park areas and on some trail types; however, as this research is focused at the municipal level, and most municipalities do not allow motorized use on their formally recognized and maintained trails, this information was ultimately not utilized as part of this research.

British Columbia Ministry of Forests Recreation Manual (2000)

Within Chapter 10 of the British Columbia Ministry of Forests Recreation Manual, titled Recreational Trail Management, there is an excellent discussion regarding trail planning, construction and maintenance in regards to trails located in provincial forests on Crown lands. The Ministry of Forests (MoF) uses an Integrated Resource Management (IRM) planning framework, upon which decisions of recreational trail provision is based. Recreation Opportunity Spectrum (ROS) analysis is then used to decide on the

appropriateness of the trail design or provision based upon user needs and usage, existing physical constraints, and land use planning and management policy considerations. Since the Ministry of Forests deals with many land use plans and existing altered environments the ROS aides in determining what may be, or should be, an appropriate social, physical and management setting for a particular recreational pursuit, e.g. number of users encountered, trail design, compatibility of use.

The MoF notes that the design guidelines in their manual were taken from the Parks Canada Trail Manual almost in their entirety, however, whereas Parks Canada does not define trail types the MoF uses the ROS classifications of semi-primitive, roaded resource and rural in the trail planning process.

The MoF manual provides an extensive discussion on cross country ski trail design, layout, grades, maintenance and the provision of structures along the trail. The manual also outlines the design guidelines for snowmobile trails, as this is often a permitted use in provincial forests.

Appendix I, Trail Design Summary from Major Trail Publications & Sport Governing Bodies, can be referenced for more complete detail of the design guidelines in the government publications listed in this section.

2.1.2 Municipal Government Trail Planning Review

2.1.2.1 Small Communities

The *Township of Spallumcheen 2001 Trails Masterplan* is one example of a small community plan for the design and implementation of a complete trail network. Although this master plan document only lightly touches on all aspects of trail planning in their community, it does provide a vision and implementation schedule for the development of their priority trail segments. Several opportunities for residents to provide input were sought via public meetings and a survey resulting in a draft, and then a final trail plan was put forward to Council for adoption and inclusion within the town's Official Community Plan.

As a small community in the interior of BC, Spallumcheen also needed to grapple with motorized and non-motorized trail use within their plan area and, therefore, classed their trails into 'types' with each providing for a range of recreational uses to help in the management of the trail system. For their trail standards, the community decided to adopt the existing standards espoused by the Ministry of Forests and BC Parks as they are considered to be the "best available practices in the Province" (Township of Spallumcheen, 2001, p. 5), and their use will help to minimize the township's exposure to risk and liability (2001). A maintenance plan for the community's trails is non-existent, as local community groups have been responsible for trail maintenance in the past and are expected to be in the future.

Whistler's *Park Visions* document is another good example of trail planning at the smaller and rural community level (1996). Most of the plan relates to a land use vision for the

community and how and where park development will occur. Park visioning, concept drawings, master plan development mapping, and heritage planning all play prominently within the plan, as does a section within the plan devoted to existing and proposed trail network, but there is no discussion in regards to winter trail planning or standards. Interestingly, *Park Visions* proposes to develop trails not merely based on use but also on geographic location, e.g. Valley Trail and Alpine Hiking Trail, and even includes policy direction for trail maintenance and development outside of their municipal boundaries. The *Whistler Trail Standards* is a recent publication by the municipality, which provides excellent trail planning and development detail, especially for mountain biking trails, for which Whistler has become known (2003). This publication is primarily focused on trail types and design standards for mountain biking. There are no standards or discussion in regards to winter use in this document, although the *Resort Municipality of Whistler* website does promote several groomed cross-country ski trails within the municipal boundary.

Elkford is nestled deep in the Rocky Mountains in south eastern British Columbia and contains several kilometers of trails, many of which can be utilized in the winter by both motorized and non-motorized forms of recreation. Elkford is one of the few communities in western Canada that has recently permitted motorized use to occur within their municipal boundary and which is regulated by bylaw (Elkford, 2006). Several multi-use recreational trails in Elkford are designated within the bylaw as specifically allowing motorized use and includes many neighbourhood linkages and links to regional trails (2006). No trail standards or design criteria are provided in the bylaw, but the local snowmobile club provides the maintenance of the trails for public use.

The recently completed *City of Kimberly Recreation Trails Master Plan* is a strategic planning document that outlines the community's desire for trail linkages and appropriate standards, upon which to build their trail network (Henderson & Associates and Kimberly Advisory Trail Planning Committee, 2003). The linking of trails, connecting of neighbourhoods and showcasing points of interest along the way are the locational development criteria for new trails. This plan utilized existing best practice in trail standards and design from several publications including Whistler's *Park Visions* for trail maintenance as well as Parks Canada's *Trail Manual*, Ministry of Environment Lands and Parks *Park Facility Standards*, and Ministry of Forests *Recreation Manual* for additional information regarding trail planning, design and construction. Types of trails proposed in the plan include urban, front country, backcountry, road-based and an abandoned rail line trail but no winter trails.

This plan also proposes that the difficulty rating system from Cross Country Canada be implemented for cross country skiing, e.g. junior, juvenile, senior, master. Trail difficulty for mountain biking trails is to be determined primarily by the conditions encountered on the most difficult part of the trail.

For a small town this trail plan is comprehensive in its detailed description of the trail planning and development process and its desire for an integrated and multi-season trail network.

2.1.2.2 Prince George Peer Communities

As a peer community to the City of Prince George, i.e. similar in size, it was unexpected to find that Kamloops does not currently have an approved plan that specifically addresses trail planning and development, as the community has several kilometres of trail and a high number of trail users; for these reasons city staff are now in the midst of developing a trails plan (S. Cook, City of Kamloops, personal communication, October 29, 2007). The new trails plan will propose to adopt the *Whistler Trail Standards* for mountain biking trails and Ministry of Environment Lands and Parks *Park Facility Standards* for other specific use trails as they are excellent publications in their respective areas (2007).

Although Kamloops does not currently have a trail hierarchy for a municipal wide system of trails, the city does recognize the importance of such an undertaking as discussed in their *Parks and Recreation Master Plan* (City of Kamloops, 2003, p. 21). Unfortunately, this community's trail information does not aid in the development of knowledge for municipal trail systems or winter use of trail systems. Snow removal on the Rivers Trail is the only form of winter trail maintenance, as no trails are packed or groomed in the City (Cook, 2007). The City's *Parks and Recreation Master Plan* notes that the Rivers Trail is the main undertaking of the community at this time so to provide high quality public riverfront access in the short term (City of Kamloops, 2003).

Trail development in Kelowna is also limited to trail policy direction noted within the city's Official Community Plan (City of Kelowna, 1995). The exception to this is the *Mill Creek Linear Park Master Plan,* which provides extensive detail about trail planning and

development along the city's premier recreational and environmentally sensitive corridor (EBA Engineering Consultants Ltd., 2000). Through an extensive public consultation process and landscape assessment, the study area was described and areas prioritized based upon public and scientific priorities related to natural, environmental and recreational features and values. The Mill Creek master plan was thus developed and included a lengthy discussion on trail development within the corridor and especially within Riparian Reserve Zones (RMZ). Design standards for trails within all areas of this linear park are provided and detailed, including standard details in regards to fencing, plantings and management expectations within the RMZ areas. Trails are classed from 'A' through 'F' based upon proximity to specific RMZ areas as well as pedestrian generators, streets, boulevards, and known types of trail use. No design details or maintenance standards are provided for the winter use of the trails within Mill Creek Park.

The City of Grande Prairie adopted a *Parks Master Plan,* which includes a subsection within the plan that details future trail planning within the community (Infrastructure Systems Ltd., 2002). This trails subsection of the Parks Master Plan provides policy direction regarding trail development standards adjacent to road right-of-ways, indicates how trail segments can be constructed during the development process, and outlines a list of specific trail opportunities worthy of consideration that would link municipal trails to regional trails. Importance is given to the development of wide asphalt trails that would connect all areas of the city to each other. Unlike the previous two plans discussed, the City of Grande Prairie recommends further consultation with the local Cross Country Ski Club to "identify a network of trails to be cleared to facilitate winter pedestrian use" (Infrastructure Systems

Ltd., 2002). The trail network consists of four types of trails including primary, secondary, tertiary and natural but none are specifically identified for winter use other than through a snow clearing maintenance plan to promote pedestrian use of the trails in the winter for walking.

The 2004 *Greater Vernon Parks and Recreation Master Plan* noted that surveys conducted over the last ten years identified trails as the most "needed or desired recreation facility"(Fay Baker Consulting & Catherine Berris Associates Inc., 2004, p. iv). The trails portion of this plan is a follow-up to the *Ribbons of Green* trail system plan of 1993, which, as the title would suggest, did not identify trails for winter use aside from snow clearing. This master plan does not replace the *Ribbons of Green* trail plan but instead seeks to implement policies supporting the direction provided in *Ribbons of Green*. Although the recommendations in this master plan look to develop new trails throughout the Greater Vernon area, in locations which receive an accumulation of snowfall, there is no provision for snow related recreational activities on trails within the boundaries covered by the plan.

Stantec Consulting completed the *City of Lethbridge Bikeways and Pathways Master Plan* in 2007. The plan incorporates the on-road and off-road trail and bicycle system into one comprehensive document. Although the plan provides for new trail standards to be incorporated into the land use planning and infrastructure development framework, and also gives an excellent synopsis of the benefits of a trail system to a community, it does not have any discussion about the winter use of the trail system. The focus of the plan is strategic to develop the proposed trail network within a ten year time frame and link the entire

community through a pathway and bicycle trail system for commuting and recreational purposes (2007). Trail standards are premised on their function first, e.g. commuter traffic, with design details determined by location (e.g. urban and paved surface). A total of six off-road pathways and six on-road pathways are proposed. None of these proposed standards discuss winter trail use or a maintenance regime to promote/allow winter trail or snow-based trail activities.

The City of Red Deer has tens of kilometres of ski trails in Waskasoo Park, that are maintained, i.e. groomed, for public use (City of Red Deer, 2008). These uses include both classic and skate ski trails, some with set double-track, and others that are packed to allow for winter walking (2008). Some trails include warming huts and lighting as well as the provision of public gathering places and parking. The City of Red Deer conducted an extensive public process in 2004 towards the ongoing development of a new trails master plan. In that survey only forty people indicated using trails for skiing out of 745 total responses, with non snow-based recreational activities making up the vast majority of uses on the trail system; walking and biking far outpaced all other uses (2008). This is surprising considering the major development of some areas in the winter for winter ski trail use; no standards could be found for the development or maintenance of these ski trails.

The City of Whitehorse approved a *Trails Master Plan* in 2007 (Inukshuk Planning and Development, 2007). The plan outlines the approved uses, planning policies, maintenance and development of proposed trails for the next ten years (2007). As a winter city having several months of continuous snow cover, there exists a deep-rooted winter culture by its

residents. This culture and the city's large municipal boundary and extensive all season use of their formal and informal trail system by motorized and non-motorized forms of recreation has required staff within the territorial and city governments to plan and manage for all uses (D. Hnatiuk, City of Whitehorse, personal communication, October 30, 2007). In that regard, and like Elkford BC, the City of Whitehorse adopted a bylaw that outlines the requirements of use of the city's trails by motorized recreational vehicles, such as All Terrain Vehicles (ATV's) and snowmobiles. Regulations regarding speed limits, safety equipment, rights of way/multi-use, and the designation of certain trails for motorized use have all been detailed and approved within that bylaw.

The Whitehorse Trails Master Plan also provides information relating to the planning and designation of proposed trails and the policies necessary for the safe use and enjoyment of existing trails. Appropriate design and construction standards of their trails are also given in that plan. Since winter use of their trail system is extensive by snowmobilers, skiers and walkers, it was necessary to plan and manage these uses effectively to avoid conflict and increase trail safety (Hnatiuk, 2007). To that end, some winter trails are designated for multi-use, i.e. motorized and non-motorized use, with maintenance provided by the Yukon Snowmobile Association via an agreement with the City of Whitehorse. A comprehensive regulatory and marketing campaign, signage, and mapping have proved to be effective measures in educating residents and visitors as to appropriate winter trail use. The City of Whitehorse is one of the only communities encountered during this research project that plans, maintains and promotes winter recreational use of all kinds on their municipal trail system.

Other communities in Western Canada of similar size to Prince George were also researched including St. Albert, Medicine Hat, Regina and Saskatoon. None of these communities has an approved trails plan but some do maintain trails for cross country skiing use; for example, the City of Saskatoon supports cross country skiing use and maintains several kilomteres of trails, some lighted, for skate and classic skiing on existing trail corridors and within some city parks (City of Saskatoon, 2008).

The other British Columbian peer communities to Prince George, by population, are the City of Nanaimo and City of Victoria, both of which have park and trail master plans that make recommendations in regards to the development of their trail systems; however, by the very nature of their geography and climate, these communities do not need to develop policies or plans for winter recreational use on snow covered trails. For this reason these two communities were not included as part of this review.

2.1.2.3 Large Communities

The very comprehensive *City of London Parks and Recreation Strategic Master Plan* made over 150 recommendations towards improving the city's recreational infrastructure with trails and pathways development being one of the major themes that the authors of the plan found during the public consultation process in regards to the development of the plan (Monteith Planning Consultants, IBI Group, JF Group Ian Seddon Planning Services & Leger Marketing, 2003). Linkages between parks, transit areas, and pedestrian traffic generators are the priority for major trail segments with an overall emphasis put on multi-use and

wheelchair accessibility (Monteith Planning Consultants, IBI Group, JF Group Ian Seddon Planning Services & Leger Marketing, 2003). As this document is strategic in nature, specific trail development opportunities, maintenance regimes or use appropriate design standards are not mentioned. As a strategic document for a very large Canadian city, it is still somewhat surprising that such an extensively researched final plan failed to mention four season use of its trail system in a known snowbelt area of Canada.

The City of Calgary's Parks Division developed and adopted an *Open Space Plan* in 2002, which provides strategic direction for the development of Calgary's trail system. The goal of the plan is to provide for a seamless connection of recreational and transportation focused pathways throughout the city and into adjoining jurisdictions for public, quality of life and economic development purposes but not at a cost to environmental sustainability or habitat quality in the pathway corridor (City of Calgary, 2002, p. 20-22). In addition, from a recreational and utilitarian perspective, the City of Calgary is renowned within the park and trail planning community as an excellent example of climate sensitive and recreational design (Pressman, 1995). In fact, according to the City of Calgary's website, this community has more kilometres of pathways and on-street bikeways than anywhere else in North America (City of Calgary, 2000). Out of the approximately 635 kilometres of pathways, the city also clears snow from 95 kilometres of those trails for winter pedestrian use, and abutting residents are required to clear pathways that run in front of or beside their property according to the city's *Street Bylaw* (City of Calgary, 2004).

It is actually the *Calgary Pathway and Bikeway Plan* (2000) that provides the necessary standards upon which this extensive trail system is developed and maintained. All pathways within the City of Calgary are preferred to be surfaced with asphalt for general ease of movement, accessibility, and safety (City of Calgary, 2000, p. 16). The plan also makes it clear that all pathways are to be multi-use, hence the desire to surface all trails with asphalt, but multi-use does not mean maintaining the trails for different uses in the winter time. The existing maintenance plan ensures that a significant portion of the city's trails are instead cleared of snow to promote pedestrian and bicycle only use. There are several open space areas, however, such as found within parks and golf courses, which have groomed ski loop trails with some track-setting for classic skiing being undertaken by the local ski clubs. Some of these areas charge fees for use to recoup costs associated with this level of maintenance (2000).

Like the City of Calgary Open Space Plan, the *North Saskatchewan River Valley and Ravine System Master Plan,* known as the Edmonton *Ribbon of Green* plan, is also a highly regarded park and trail planning document as it shows how decisions can be made regarding recreational trail use premised upon "environmental and resource constraints of an area" (City of Edmonton, 1992, Executive Summary). Management Planning Units (MPU) have zones (e.g. preservation, conservation, extensive use) based upon ecological sensitivities and hence the types of recreational use permitted within each zone must coexist with the natural environment without it being detrimental to its overall health (City of Edmonton, 1992). Standards for trail design in these MPU's are first determined by the environmental factors which exist there and then by the plan's proposed recreational use; thus the trail standards

themselves become the use-limiting factor. To this end, three trail standards are put forth in the Ribbon of Green plan to help balance recreational use with protection of the natural environment. The plan includes design standard variations in trail width, use, surface treatment, and siting between three trail types, Class 1, Class 2 and Class 3 (City of Edmonton, 1992, p. 45).

Due to the extensive use of this trail network in the winter, the Ribbon of Green plan also notes the need to accommodate cross country ski use, but no maintenance or development standards are provided within the plan to aid in such planning. Over 10kms of trail in the plan area are currently groomed by a local ski club for all types of skiing with some trails lit for night skiing.

The City of Winnipeg has embraced a plan to connect trails throughout the community by using the river frontages as the main spine for the development of a community-wide trail system (Baronas, 2003). The *City-Wide Riverbank Parkway System* is the plan that details the planning, trail types, appropriate uses and development of trails along these riverfronts, but many other trails, including many kilometers of ski trails, also exist in the greater community of Winnipeg (Marr Consulting & Communications, 2005). Ski trails within the city are often made by cross country skiers themselves along the riverfronts, but maintained ski trails are also provided by the City within several parks; a skate ski trail is maintained by the City along one section of riverfront with a walking path also maintained separately but adjacent to it with other ski trails created as loops (2005). In all, over 40kms of trail are

maintained by the city for cross country skiing use, but no standards are given for their planning or maintenance (City of Winnipeg, 2008).

The *Trails Master Plan* for Strathcona County is a very detailed trail plan, one which deals specifically with winter trail issues, design standards and use (Bruyere, 1998). The plan outlines trail development opportunities, standards and policy direction related to multi-season trail use including cross country skiing and snowmobiling. With the help of the Snowmobile User Group in the planning process, Bruyere (1998) had the foresight to note high and low priority snowmobile trails to aid in the future planning of such links in relation to other trail users and land uses. The plan also provides for specific standards and policies to allow snowmobiling within the plan area. Cross country skiing in the plan is also given the same level of attention, and the plan includes a map which identifies all of the ski trail routes in the county.

Economic impact numbers are provided for the different trail uses, showing that skiing and snowmobiling have a significant impact on the Strathcona County and provincial economy (Bruyere, 1998, p. 28-29). Bruyere also notes that "trail users with the best economic impact statistics to offset financial costs are the ones who are going to hold on to critical trail space" (Bruyere, 1998, p. 29). Unlike the *Calgary Pathway and Bikeway Plan,* or the *Ribbon of Green* plan for Edmonton, there is a direct connection made to the positive economic impact created by trail use on the regional economy. This impact is then used towards the justification of funding and development of the existing and proposed winter trail system.

Although the Trails Master Plan for Strathcona County is excellent, overall the *Lebanon Hills Regional Park Master Plan* (Minnesota, U.S.) is the most comprehensive municipal-based land use planning document found to date pertaining to trail development for all season and multi-use of trail systems (Brauer & Associates, 2001). Lebanon Hills is located in Dakota County in the State of Minnesota and is a park of approximately 200 acres of rolling hills of open space immediately adjacent to an urban area. Grounded in ecological planning principles, the recreational uses were then determined and developed resulting in a park and trail master plan. Trails are managed first for environmental sustainability then for both summer and winter trail uses. Use of the ROS management approach drives the planning of this developed regional park towards the goal of "achieving harmony between recreation expectations and the environmental setting" (Brauer & Associates, 2001, p. 5.59).

Summer trails in Lebanon Hills are categorized by use and are typed as either nature trails, connector trails, equestrian trails or mountain bike trails, with each having their own set of standards (Brauer & Associates, 2001). Most notable is that the plan also categorizes winter trails by use into classic ski trails, skate ski trails, hiking trails and snowshoeing trails (Brauer & Associates, 2001). As with the summer trails, each category of winter trail is provided with its own planning standards and definitions for each activity which are then used to propose appropriate support facilities for each use on the trail system, e.g. parking, restrooms, storage, ski patrol (Brauer & Associates, 2001). The standards for each type of activity are also graphically illustrated within the plan. Although their standards are not given in this plan, dogsledding and skijoring are specifically mentioned as appropriate uses on the trails at certain times; aside from the City of Whitehorse *Trails Plan,* this is the first

such mention of these sports in any trail or park plan reviewed in this research. Finally, the plan also discusses maintenance of these trails in a section of the plan dedicated to the grooming of the trails for winter use.

2.1.2.4 City of Prince George City Wide Trail System Master Plan

The 1998 City of Prince George *City Wide Trail System Master Plan* compares well with peer winter city communities of Grande Prairie, Lethbridge, and Whitehorse for providing a comprehensive evaluation of existing and proposed trail links. The City of Prince George does not compare well to Red Deer or some other larger cities such as Calgary, Edmonton, Saskatoon or Winnipeg in the provision of maintained winter trail opportunities that allow for snow-based recreation such as skiing. Prince George's trail plan provides policy direction for future trail development, a trail classification system, a listing of trail priorities for the entire city, city wide trail mapping, and graphically details proposed trail design standards, but there is little mention of the winter use of trails. Trail standards are based on summer use and by surface conditions during those summer months. Multi-use trail, or 'City' trail standard, is a wide paved trail, a 'local' trail is gravel surfaced and narrower, while a 'rustic' trail is the narrowest and is found only in natural areas and has a natural surface. The plan's author does note that Prince George is a winter city, and therefore use of the trails for winter recreational activities should be considered but does not provide any other comment regarding winter trails beyond that (Brockington, 1998).

2.2 Seasonal Trail Planning and Design Standards

Trail designs are premised on several factors including local topography, soils, hydrography and of course, especially in an urban setting, the existing and proposed built environment, e.g. buildings, roadways, underground infrastructure. Fundamentally trail designs must also consider as part of the preliminary design plan the environmental considerations of which trial siting and use could have an impact (Flink, Olka, Searns, 2001; British Columbia Ministry of Lands and Parks, 2005). Such environmental considerations are very important in an area such as Prince George, where the urban/rural/wilderness fringe is amorphously defined.

For the aforementioned reason, considerations must be given to appropriate environmental trail design so as to lessen the impacts of trail development to the greatest extent possible on a particular area; or even to aid in the determination not to develop a trail in that area at all (Fisheries and Oceans Canada & BC Ministry of Environment, Lands and Parks, 1997; Lanarc Consultants, 1994; Lanarc Consultants, 1995). Planning considerations include the need to locate trails outside of a 30m buffer/leave zone from the top of bank of a fish-bearing stream and a buffer of at least 15m from the top of bank for non-fish bearing streams (Lanarc, 1994). These 'leave' zone areas are meant to be left in their natural state and have no development within them unless prior approval is given from the Department of Fisheries and Oceans and Ministry of Environment (Lanarc, 1994). Development of trails adjacent to aquatic habitat can be accomplished so as to not detrimentally impact upon the riparian zone or water quality but requires an investment in pre-planning and design effort (Lanarc, 1995; Fisheries and Oceans Canada & BC Ministry of Environment, Lands and Parks, 1997).

With respect to aquatic habitat, one of the largest issues is that of sedimentation and adding of deleterious substances to the water, thus deteriorating the water quality and negatively impacting upon the fish and other forms of aquatic life (1997). For this reason, trails should be located outside of the riparian zone wherever possible. If no other options exist, or getting users to a significant point of interest is highly desired, the trail design in such situations should then be direct to the viewpoint and not designed as a meander along the riparian zone (Lanarc, 1995).

The use of winter trails by skiers, for example, in of itself may not be seen to be a concern adjacent to fish habitat, but the maintenance of the trail by a groomer or snowmobile may be as these vehicles do pollute the air with exhaust and sometimes leak oil. In addition to those environmental impacts, the noise and vibration caused by these machines can also significantly disrupt wildlife as discussed next.

In regards to wildlife, two of the most critical areas of concern when it comes to trail planning is that of the mitigation of fragmentation that could be caused by developing trails that block safe or migratory wildlife routes, and that of wildlife 'influence zones' (Lanarc, 1995; Colorado State Parks & Hellmund Associates, 1998). Trails can increase the chance encounters between people and wildlife, which can create significant stress on the animals or even lead to death (Colorado State Parks & Hellmund Associates, 1998). The 'influence zone', where wildlife may change their behaviour because of adjacent development, varies considerably by species, and thus it is important that wildlife habitat of the area be known

prior to trail planning being undertaken (1998). Such knowledge can dramatically change the trail direction, placement, type and use from what originally may have been intended. For winter trails in the north, information that should be considered would include the numbers and types of wildlife species, denning areas, corridors, winter ranges, limits of riparian zones, microclimatic changes, and vegetation types as the proposed trail may influence one or many of these (1998). As noted previously, the use of groomers and snowmobiles to maintain a winter trail can have significant impacts on wildlife, and therefore sensitive habitat should be avoided by trails that require such maintenance.

In Prince George, the Official Community Plan (OCP) notes several sensitive natural features such as wetlands, significant fish bearing streams, significant ungulate, bear and waterfowl habitat, as well as ungulate winter ranges (City of Prince George, 1998). If major development is proposed in any of these areas, a wildlife and/or fisheries study may be requested by the City of the applicant. If it is a city-led trail development, the decision to undertake an environmental study is at the discretion of city administration. Steeply sloped areas, greater than 20% slope, are also noted in the OCP due to erosion and slope stability concerns, and thus trail development in these areas may require further study in the form of a geotechnical information report, indicating that trail development, for example, will not cause slope failure.

Municipalities must grapple with the planning for many of the issues noted above, with some being more prevalent than others. Due to residential density, and unlike regional and Crown land recreational trail systems, municipal trails often receive more cycling and walking use

for both recreation and transportation purposes (City of Calgary, 2000). Likewise, snowmobile and equestrian use of municipal trail systems is often limited by regulation due to known or potential for conflict. Several publications note that, although it may not be possible to design trails to meet all of the potential recreation uses for the site, it is possible through trail design and standards to mitigate some of the impacts that could be created between users while still allowing a great recreational experience (Flink et al, 2001; Demrow et al, 1998; Train, 2004). At the municipal level, this is very important when trail planning due to the greater density of use and the complicating design factors related to the built environment, i.e. roads, houses, infrastructure, land use plans, as well as need to consider the natural environment within the urban landscape, e.g. rivers, streams, parks, forests.

In the peer communities to Prince George, as well as larger cities, the clear desire is to accommodate as many uses as possible. It is due to the environmental, infrastructure and density factors encountered at the urban levels that trail planning had to evolve to the point where desired trail attributes for specific users were better understood. To accommodate these trail uses in an urban setting, trail standards have been modified so that the environment is respected and trails function as multi-use, i.e. recreational and utilitarian amenity, in essence an integrated planning approach where resident's trail needs and desires are balanced with natural systems at the community level (Lanarc, 1995).

Historically, therefore, trail types developed at the municipal level have generally taken on three forms. The first being a wide asphalt trail that is meant to accommodate many uses in the highest trail use areas, and/or commuter routes, of the municipality. These asphalt trails

form the spine of the trail network. Next are widened gravelled trails located in and between neighbourhood areas and which connect to the multi-use trails and to natural areas. Depending upon trail usage and density, some neighbourhoods will have both asphalt and gravel trails forming the neighbourhood trail network. Finally the natural trail is a narrow and naturally surfaced trail located within areas that are environmentally sensitive or wilderness and which fit more appropriately with the aesthetic, environmental, or other open space management purpose of the land.

Figure 2 - Typical Municipal Trail Types

Asphalt Gravel Natural

One other trail type which some municipalities identify, is an 'informal trail' that is neither planned nor maintained by the municipality and does not meet an approved trail standard, but which has been historically utilized by small numbers of local residents (Inukshuk Planning and Development, 2007; Henderson & Associates, 2003; Kimberly Advisory Trail Planning Committee, 2003). These trails may be identified by the municipality for long range land use planning purposes but are not maintained by them, e.g. City of Whitehorse, City of Kimberly.

The determination of asphalt, gravel and natural trail types is based upon the types of users and their needs, and the trail location and management purpose of the land upon which they will sit. The remainder of this section speaks more specifically to trail types and seasonal and winter trail uses commonly found in municipalities. A detailed summary of this information is located in Appendix I.

2.2.1 Multi-Use Trails

These trails are meant to handle high levels of use by many different trail users. In particular, a multi-use trail at the municipal level, should be virtually barrier-free for those individuals that would be challenged to utilize other trail types, e.g. young children, parents with strollers, elderly, physically handicapped (Flink, Olka, Searns, 2001; State of Minnesota, 2007). Multi-use trails are often part of the commuting and/or cycling trail network for pedestrians and cyclists due to their capacity to handle high levels of use, have an asphalt surface and are located usually in areas of high density.

Some multi-use trails in the literature were identified as being able to be utilized for multiple uses while also indicating in the trail development standards that they are barrier-free, but this was not always the case (Brockington, 1998; Trails BC & Outdoor Recreation Council of BC, 2000). Multi-use trail designation could mean that such trails permitted two or more uses on a specific trail but, for example, a trail surfaced with natural materials and designed for recreational sport activity such as mountain biking or equestrian use will most likely not be completely barrier-free. If only one type of a multi-use trail standard is utilized within a municipality, e.g. wide and paved high use trail, it should be designed as completely barrier-free, as it will be assumed by physically challenged users to be so (State of Minnesota, 2007). These multi-use trails are often 3.0m wide, at a minimum, and can go well beyond 6.0m in width depending upon usage types, level of use, bidirectional traffic, points of interest and locational constraints (City of Nanaimo, 2007).

From a winter trail planning perspective, it should not be assumed that existing seasonal multi-use trail systems are either multi-use or barrier-free during the snow free months of the year as climate, maintenance, uses, design and location may make them impassable or only usable by specific users. Design and maintenance standards during the winter will thus determine the type(s) of use of these trails, as well as their level of use. Since the function of the multi-use trail impacts the most number of people in a community because of its higher level of existing use and usually centralized location, and has often undergone the most planning, design and maintenance, it is also these trails that hold a significant amount of promise for accommodating high levels of winter trail usage as well. Multi-use trails have

the widest trail tread and clearance zones (i.e. trail tread and cleared buffer areas adjacent to the trail) and thus permit a greater range of uses in the winter for snow-based trail activities.

2.2.2 Specific Use/Natural Surface Trails

In as much as multi-use trails seek to accommodate as many uses as possible on the tread path and in the trail corridor, a 'specific use/natural surface' trail limits use due to the trail surface, which consists of gravels or dirt surfaces. These trails may allow more than one use on the tread path, but some trails are planned and designed primarily for a single use due to the design criteria needed for safety as well as enjoyment related to a specific activity, e.g. equestrian, mountain biking (State of Minnesota, 2007).

Gravel trails on the other hand can accommodate a high level of users and activity types and may be barrier-free. Depending upon the type of gravel surfacing used, e.g. crushed gravel, limestone, the material itself could be a deterrent to trail mobility for some users, which in itself may be the desired management effect in some areas. Gravel trails allow excellent permeability, are considered aesthetically pleasing in natural areas, and cost much less per metre to develop than a comparable asphalt trail in the same location. Such trails also lend themselves better to winter use as discussed more below.

Natural surfaced trails may utilize grass, wood chips, soils, and gravel to achieve the desired tread path. These trails are typically located in less travelled areas of the community such as in natural parks or open space located in wilderness areas. Depending upon the park

management intent, location, or property ownership, the access to and trail standards for these areas are designed for less concentrated use or to reflect the intent to accommodate only one or a few recreational activities. Aside from hikers, horse riders and mountain bikers are the next most often users of these trails during the snow free months of the year.

From a maintenance perspective, these trails are very good for snow-based recreational activities due to the natural surfacing treatments used (e.g. wood chip, grass), as such materials hold snow for longer periods of time. In contrast, asphalt surfaced trails, in particular, become heat stores that will prematurely melt snow in the sunshine or when temperatures are closer to the freezing point (State of Minnesota, 2007).

The existing municipal trail design standards for these trail types does become a somewhat limiting factor as their tread width usually approximates 1.0m – 2.0m or less, have a clearance zone of approximate 2m – 3m and may have several significant slope areas of between 20% - 40%, meaning that the types of winter uses on those trails are restricted. Such trails may be restricted to users of a higher ability (e.g. expert skier), not only because of the width but also because of the number and severity of the slopes encountered along the trail. The need to plan with the clearance zone in mind thus becomes more critical to accommodating a greater number of users and abilities as the entire width of the trail corridor can be maintained in the winter as the 'winter trail tread' since it is covered in snow. For a natural surface trail, such a clearance zone would extend at least 1m on either side of the trail thus, for example, making a seasonal 1m wide natural trail three times as large in the winter

at 3m in width (1m trail tread width + 1m one side + 1m other side = 3m total winter tread width); or a gravel trail of 2m tread width having a 4m winter tread width.

2.3 Winter Trail Uses and Design Standards

Outside of coastal regions of British Columbia, precipitation can occur in the form of snow, often starting in the month of October and continuing into April. With an average annual snowfall in excess of 200cms, the City of Prince George trail system can support various forms of winter recreational uses that require a base snow layer on the trail (City of Prince George, 2001). The most common winter recreational uses requiring snow covered trails are shown in the following figures:

Figure 3 - Nordic Skiing

Figure 4 - Snowmobiling

Figure 5 - Dogsledding

Figure 6 - Skijoring

Figure 7 - Snowshoeing

Below is a brief discussion regarding the synthesis of the literature in regards to the appropriate trail design for these activities.

2.3.1 Nordic Skiing (Cross Country Skiing)

Trail standards for Nordic skiing can be found through several sources (Beardmore & Kaegi, 1999; Cross Country Canada, 2004; Federation Internationale De Ski, 2004; British Columbia Ministry of Lands and Parks, 2005; British Columbia Ministry of Forests, 2000; Flink et al, 2001). Beardmore and Kaegi, as part of their Nordic skiing capability model, utilized the knowledge from local ski trail users and standards espoused by Cross Country Canada (1999). The standards as set by Cross Country Canada are meant for Nordic skiing competitions but are still very useful as a benchmark for more extreme ski trail design, as it is expected that there may be opportunities in the future for some competitive skiing events to take place on municipal trails (Cross Country Canada, 2004). Trail standards for skiing can also be found in several other publications and books as cross country skiing has a significant following as a leisure and sport activity (Flink, Olka & Searns, 2001; BC Ministry of Lands and Parks, 2006; British Columbia Ministry of Forests, 2000). As shown in Figure 12 illustrating the Trails Task Force questionnaire results, in Prince George cross-country skiing has become one of the most sought after winter experiences by residents.

Nordic skiing has two main variants, 'classic' and 'freestyle'(skate skiing), with both being used in racing competitions. Since classic skiing involves only a forward and back motion of the skis the trail width does not need to be as wide to accommodate the activity as it does for

freestyle (skate) skiing. Freestyle skiing allows the skier to use both side-to-side and front-to-back motions with their skis to propel themselves forward. Regardless of technique, cross country skis can be longer than 2m in length, so the sideways pushing of the ski out and away from the skier means that extra trail width is needed away from obstructions and other skiers. Classic skiing trail widths range from a minimum of 2.0m in low use park areas to over 5m in a recreational setting for bi-directional freestyle skiing, and 9m for some sections of race course uphills for freestyle skiing; a vertical clearance zone above the snow tread width should be 2.5m (Cross Country Canada, 2004; Brauer & Associates, 2001; British Columbia Ministry of Lands and Parks, 2005).

Grades for both types of skiing also vary considerably and depend on the trail intent. From a design perspective, the trail planner should allow for low grades early in the trail looping and then allow for an increase in grades in the outer loop system for more advanced skiers. Data in regards to appropriate slopes for ski trails is provided in Appendix I.

2.3.2 Snowmobiling

Snowmobiling is the fastest growing winter recreational activity in Alberta (Bruyere, 1998). Trail standards for the sport have now begun to appear in trail literature as it is recognized as an important player in community and provincial economic development as well as the impact it can have on the environment and multi-use trail systems (Bruyere, 1998; British Columbia Ministry of Forests, 2000; Wade, 2000).

The British Columbia Ministry of Forests (2000) and British Columbia Ministry of Lands and Parks (2005) snowmobile trail standards are very detailed and include most of the same information that is included for non-motorized trail planning such as trail difficulty ratings, grades, tread width, and cross slope specifications. Beardmore and Kaegi (1999) also gained excellent information from snowmobile users for their modeling of potential sites for snowmobile activity. The trail design standards for snowmobiling must take into consideration the ability of the motorized machines to gain speed quickly, and therefore sightlines, stopping distances and compatibility with other non-motorized uses become very important trail planning and design considerations (Flink, Olka & Searns, 2001). Generally, the planning of such snowmobile trails has taken place on public lands outside of municipal boundaries.

The first planning consideration must be whether or not the community in question wishes to consider the establishment of snowmobiles trails within their municipality, where they will be allowed, and what regulations regarding their use will be employed. Such trails, if permitted, need to be at least 3m wide, preferably over 4m to allow safe bi-directional travel. Grades can range dramatically as snowmobiles can easily climb most small hills of less than 15% depending upon the depth of snow cover. Since the literature notes that most existing heavily used municipal trails are less than 15% slope, less than 10% for multi-use trails, and clearance zone widths greater than 3m, the question becomes more of trail suitability rather that capability for this use as many non-motorized multi-use trails have these same trail characteristics.

2.3.3 Dogsledding & Skijoring

According to the International Sled Dog Racing Association's (ISDRA) website, dogsledding is a form of recreation and competitive sport that is found in many Canadian communities and throughout the United States and other countries around the world (International Sled Dog Racing Association, 2006); however, a thorough review of trail documents related to trail plans and standards as part of this research appears to show that dogsled trail standards have not been studied in Canada. In fact, the absence of discussion and research on planning for winter dog powered sports in general, i.e. dogsledding and skijoring (skier pulled by dogs), was very evident. The ISDRA Race Manual and a new State of Minnesota trail design guidelines manual are the only documents that provide a comprehensive commentary and set of design guidelines in regards to appropriate trail design and maintenance standards that will be safe, enjoyable, interesting, and fast for dogsledders and skijorers (Fishback, 1986; State of Minnesota, 2007).

The ISDRA guidelines on trail design, although written in an informal and jargon filled style, are actually quite informative as they provide numerous and graphically detailed trail design examples with commentary on each. Different trail layouts, signage, snow packing, weather conditions, bridges, curves and vegetation management are all covered within this manual. The commentaries consist of quotes from notable mushers who race and design dogsled trails and inject valuable first hand information into these guidelines. Preferred trail standards include a minimum 3m wide trail, 30m minimum curve radius and a trail design speed of 50km/hour.

Two other good publications in regards to trail design for sled dog racing are MUSH (Levorsen, 1997) and Dog Driver (Collins & Collins, 1991). The authors focus primarily on the training of dogs for the sport, i.e. nutrition, equipment and commands, but each also devotes a chapter in their books to trails. Trail layouts, surface conditions and precautions are all discussed although not in near as much detail as in the ISDRA manual.

The State of Minnesota in their trail design guidelines manual notes that cross country ski trail design standards can be used for dogsledding and skijoring trails but that the higher end of the ski trail standards be given preference to better accommodate the additional speed gained by these users because of their dogs (2007).

2.3.4 Snowshoeing

Snowshoeing is a form of winter hiking that can occur in moderate levels of snow due to the design of the snowshoe which enables individuals to 'float' on top of the surfaces (Demrow & Salisbury, 1998). It is because of this ability to tread through snow that snowshoers often seek out similar trails to that of the backcountry skier where some solitude can be enjoyed within a natural and relatively remote setting (1998). Where more intensive backcountry skiing takes place, conflicts may still arise between these uses due to snowshoe tracks ruining the ski tracks that had been previously set by other ski users or a track setting groomer.

Because of the similarities in trail user preferences between backcountry hikers and snowshoers, the British Columbia Ministry of Lands and Parks Park Facility Standards

manual uses the same general siting and design criteria for snowshoe trails as they do for hiking trails (2006).

2.4 Trail Planning Frameworks

In the review of the literature, four main recreation provision philosophies underpinned the planning and development of trails. Only one document for each planning philosophy specifically identified their chosen development strategy as coming from either a Carrying Capacity (CC), Recreation Opportunity Spectrum (ROS), Limits of Acceptable Change (LAC), or Benefits-Based Approach (BB). Many of the municipal plans reviewed did not state a planning framework, although there is an emphasis on the multiple-use of trails and that accessibility by as many residents and visitors as possible is highly desired (City of Calgary, 2000; Stantec, 2007; City of Nanaimo, 2007).

Parks Canada (1978) espouses the Carrying Capacity (CC) planning philosophy as being the most appropriate method of determining the level of changes to the natural environment that is acceptable because of the desired recreational use. Ecological impacts and the intensity and type of trail use are considered in determining where the balance lies between trail use and unacceptable environmental degradation. From this planning perspective, Parks Canada developed trail standards to aid in the management of trail use in Canada's National Parks.

Since 1995 the British Columbia Ministry of Lands and Parks has used a Limits of Acceptable Change (LAC) planning model. Unlike the CC approach where limiting trail use is a main management feature to the protection of the environment, the LAC approach

develops ecological and social indicators of acceptable and unacceptable changes for the plan area and lists management responses to those changes. Extensive participation in the planning process by the public is also encouraged due to the desire to create an outstanding trail and trail experience for the public (British Columbia Ministry of Lands and Parks, 2005).

The British Columbia Ministry of Forests (MoF) (2000) uses a strategic planning process for the determination of use of provincial Crown lands in BC. Within those processes and plans the Recreation Opportunity Spectrum (ROS) is used for reviewing existing trail provision and opportunities for new trail development. Social, physical and management settings help to determine which type of trail and use may be considered for development, but such trails must also be consistent with the concept plan for the area previously developed by MoF through their strategic planning process.

The most recent planning approach identified within the scope of this project and review of the literature, and the only one explicitly noted for municipal level trail planning, is that of the Benefits-Based (BB) philosophy. The City of Whitehorse in their 2007 Trail Plan was the only municipality that noted a need to provide trails based not only on demand but also in regards to the "quality of the experience" (p. 11) that may be obtained by the user. The BB approach places significant priority on the other benefits that accrue to the community as a whole from trail provision. This approach differs significantly from other municipalities reviewed whom address trail provision from a demand driven and multiple-use perspective, e.g. City of Prince George, City of Edmonton, City of Calgary, Strathcona County.

2.5 Synthesis of the Literature

The review of the literature clearly shows that there is a general lack of information regarding standards and planning at the community level in regards to winter trails. The larger communities in the review provide very detailed environmental and geophysical information, discussions surrounding multi-use, infrastructure development, costing and priority setting but have limited comment in regards to winter use of trails. This is in spite of the fact that many of these larger communities have several kilometers of trails for skiing thanks mostly to non-profit organizations such as ski and snowmobile clubs. The maintenance regime for the majority of trails within these communities continues to be that of clearing snow from the trails rather than maintaining them for other winter uses. It is interesting that the two trail plans which do discuss winter trail use at length are both for regional trail systems, Strathcona County and Lebanon Hills. This may be at least partially due to the expansiveness of their areas to accommodate such a range of uses. What is not clear is why some municipalities do not plan for and accommodate, in a comprehensive and integrated manner, winter uses in their highly regulated, well-staffed and financially able urban environments, especially with community groups that have been shown as willing to provide the service, such as is done in Whitehorse, Saskatoon, Calgary. The review of the literature also revealed that most communities are planning for increased use of their trails although not necessarily for snow-based trail activities, Red Deer and Whitehorse being the exceptions.

Excellent publications do exist in regards to trail standards, planning, development and management of winter trails. The challenge continues to be the incorporation of standards for winter trail uses into the municipal trail planning realm as three-season multi-use trail development continues to dominate the trail planning focus of most winter communities. An integration of winter trails as part of the existing community trail network does not yet appear to be a consideration in trail planning practice at the municipal level.

At the municipal level, multi-use trails accommodate virtually all trail activities with many of these trails being barrier-free; however, some uses are not compatible with that of multi-use such as equestrian and mountain biking because of aesthetic, environmental, and topographic considerations or adjacency to other trail uses. Some uses are more appropriate for multi-use winter trails than others, and thus some non-compatible uses should be kept to specific use trails only or not planned for at all, e.g. snowmobiling. Very important at the municipal level is the need to integrate the recreational with commuting component regarding multi-use trail planning. Winter trails of packed snow could be used for both purposes, although snow clearing of major trail routes that connect with destination areas such as schools, transit, and commercial areas continue to be almost always cleared of snow. Such maintenance decreases the possibilities of other uses on those trails whereby all uses may be able to be accommodated on those trails if the snow was packed instead of cleared, e.g. City of Whitehorse.

Trail design standards for skiing, skijoring and dogsledding will require that current minimum tread width and adjacent buffer areas be met when developing municipal multi-use

trails. The space available for these trail activities to take place does increase in the winter, as vegetation on the sides of the trail is non-existent during the snow months, thereby allowing the entire trail clearance zone to be used as the 'winter tread width'. This clearance zone should ideally be at least twice that of the seasonal tread width to meet the recommended trail width standards for these types of winter uses.

Although dogsledding, skijoring and snowshoeing are all growing in popularity the need to plan for these uses at the municipal level is not yet proven. In spite of this, when ski trails are designed to appropriate standards, these trails may still allow for additional uses such as dogsledding and skijoring to be accommodated on the trail. Snowshoeing on the other hand has locational attributes best suited for backcountry and rural areas; hence specifically planning for snowshoeing trails need not be formalized at the municipal level as locational requirements for that use cannot be adequately addressed in an urban environment and snowshoeing activity continues to be very low.

Locational criteria for planning winter trails is important and based primarily upon three tenets as noted in the literature:

1. Unsafe or environmental sensitive locations cannot be used as sites to establish winter trails, e.g. wetlands, lakes, wildlife habitat, riparian areas;
2. South facing slopes should be avoided due to the issue of snow retention;
3. Resident proximity to winter trails should be within a walkable distance, i.e. 5 minutes (400m).

Several communities in the review noted the use of golf courses and city parks as very good areas to allow and groom trails for skiing. Volunteer groups often came forward and provided volunteer support to the establishment and maintenance of winter trails in these areas with some charging for use. Such areas should be considered in the winter trail planning process, as many parks and golf courses are not maintained for any other purpose in winter and thus skiing is a low-impact use, and better annual utilization, of these public lands.

The locational criteria are both regulatory and site specific but also based upon the a desire to provide recreational infrastructure in amounts, types and locations to benefit as many people as possible. At an urban level, and as recently espoused in the City of Whitehorse Trail Plan, there is an increasing understanding of the holistic benefits created by the provision of recreation opportunities for residents, most importantly better health and a reduction in vehicle use and associated transportation costs (2007). The demand management approach to trail provision used in almost every other community researched fails to create opportunities and choices for recreation and non-motorized transportation 'ahead of the curve' leading to a continuation of the status quo (Inukshuk, 2007). Change appears to come slowly even in communities whose residents clearly link the desire to plan sustainably so as to better their health and overall quality of life (City of Prince George, 1998; Michalos, 1995; Russell, 2007).

Figure 8 provides a snapshot of the winter trail standards espoused in the literature. A more complete summary of winter trail design standards taken from provincial and federal governments and sport governing bodies is detailed in Appendix I.

Figure 8 - Focused Synthesis Winter Trail Standards Summary

Publication	Winter use	Trail surface	Tread width	Clearance zone	Grade
Lebanon Hills Regional Park Master Plan (Brauer & Associates, 2001)	Classic ski (single track)	Groomed	0.3m	1.5m	Easy to moderate
	Classic ski (double track)	Groomed	1.8m	3.0m	Easy to moderate
	Skate ski (single track)	Groomed	n/a	2.4m	Easy to moderate
	Skate ski (double track)	Groomed	n/a	4.9m	Easy to moderate
	Snowshoe	unmaintained	n/a	n/a	Easy to moderate
BC Ministry of Lands and Parks (2005)	Skiing Type I	n/a	5.5m	5.5m	5-10%
	Skiing Type II	n/a	3.0m - 4.0m	3.0m - 4.0m	18-25%
	Skiing Type III	Packed	1.0m – 3.0m	1.0m – 3.0m	40% max
	Snowshoe	various	1.0m – 3.0m	1.0m – 3.0m	40% max
BC Ministry of Forests (2000)	Novice	n/a	5.0m	5.0m	10%
	Intermediate	n/a	3.0m- 4.0m	3.0m - 4.0m	25%
	Expert	n/a	3.0m	3.0m – 4.0m	40% max
Parks Canada (1978)	Skiing	Various	1.5m – 3.0m	1.5m – 3.0m	*Novice 10% max.* *Intermediate 25% max.* *Expert 40% max.*
Strathcona County Trails Master Plan	Skiing	Various	0.6m – 3.0m	1.8m – 5m	n/a

Publication	Winter use	Trail surface	Tread width	Clearance zone	Grade
(Bruyere, 1998)					
Cross Country Canada (2004)	Classic ski (double track) Skate / freestyle ski (double track)	Groomed Groomed		3.0m – 6.0m 4.0m – 9.0m	9 – 18% 9 – 18%
International Sled Dog Racing Association (2002)	Dogsledding	Groomed	2.0m – 3.0m	n/a	moderate
Complete Guide to Trail Building & Maintenance (Demrow & Salisbury, 1998)	Classic ski (no track) Classic ski (single track) Classic ski (double track)	Unmaintained Groomed Groomed	n/a n/a n/a	1.2m – 1.8m 2.5m – 3.0m 3.0m – 4.0m	*Novice 7-8%* *Intermediate 12-15%* *Expert 20-25%; 40% maximum*
Trails for the 21st Century (Flink, Olka & Searns, 2001)	Skiing (one-way) Skiing (two-way)	n/a n/a	1.2 2.1m	1.8m 2.7m	3-5% 3-5%
City of Kimberly Recreation Trails Master Plan (Henderson & Associates and Kimberly Advisory Trail Planning Committee, 2003)	Skiing Skiing Snoeshoe & ski touring	Groomed Unmaintained Unmaintained	3.0m 1.0m – 3.0m 0.5m – 1.0m	6.0m n/a 1.5m – 3.0m	n/a n/a n/a
Trail Planning, Design, and Development Guidelines (State of Minnesota, 2006)	Classic ski (single track) Classic ski (double track) Skate ski (single track)	Various Groomed Groomed	1.8m – 2.4m 2.4m – 3.0m 2.4m – 3.0m	2.4m – 3.0m 3.0m – 3.6m 3.0m – 3.6m	*Novice 4-10% (12% max)* *Intermediate 6-12% (18% max)* *Expert >12% (18-40% max)*

Publication	Winter use	Trail surface	Tread width	Clearance zone	Grade
Trail Planning, Design, and Development Guidelines (State of Minnesota, 2006)	Skate ski (double track)	Groomed	4.3m – 4.9m	4.9m – 5.5m	n/a
	Classic & Skate ski (two-way)	Groomed	4.9m – 6.1m	5.5m – 6.7m	4-12%
	Snowshoe trail	various	1.8m – 2.4m	n/a	4-12%
	Dogsled trail	Groomed	2.4m – 3.0m (4.9m racing)	3.0m – 3.6m (5.5m racing)	4-12%
	Skijoring trail	Groomed	2.4m – 3.0m (4.9m racing)	3.0m – 3.6m (5.5m racing)	4-12%

2.6 Project Research Questions

There are five research questions which were derived during the focused synthesis for this project. Since a focused synthesis itself is considered a research method some knowledge regarding the first three research questions has now been obtained.

1) What trail design standards are currently in use at the municipal level in winter cities?
2) What types of uses occur on municipal trails in winter?
3) What trail design standards are currently espoused for snow-based winter trail recreational activities?
4) Considering existing municipal trail design standards and trail uses, what are the most appropriate winter trail design standards that can be utilized at the municipal level?
5) Using a GIS and the recommended standards derived from this research, what existing and proposed trails within the City of Prince George are capable of, and suitable for, winter recreational purposes?

3.0 Methods

3.1 Mixed Methods Approach

A mixed-methods approach, utilizing both quantitative and qualitative methods, will be used for this research. Use of mixed methods in the data collection process allows for both qualitative and quantitative tools to be utilized hence increasing the reliability of the research (Tashakkori & Teddlie, 1998). In contrast to a monomethod research approach, use of mixed methods supports the concepts of data and method triangulation (Tashakkori & Teddlie,

1998; Bryman, 2004). The building of 'checks and balances' into the research design increases the "strength and rigor of an evaluation" (Patton, 1987, p. 60), so in order to increase the reliability and validity of the data collected during this research, two triangulation methods were used (Patton, 1987):

1. Methodological triangulation – using different methods for the study (e.g. focus group, questionnaire, public open house)
2. Data triangulation – the use of varied data sources (e.g. focused synthesis, questionnaires, open house comments)

From the beginning of this research, it was understood that use of previous trail–related survey results in Prince George alone would not be a rigorous enough method in helping to gain the information needed to ascertain the most appropriate municipal winter trail design guidelines. With the exception of the city's Trails Open House survey of 2004 (Kosec, 2005), previous surveys at the City of Prince George gave only cursory treatment to the collection of trail information and did not ask detailed questions pertaining to the level of use of the city's trail system in winter, satisfaction levels regarding trail standards and maintenance in winter, or acceptable winter trail uses (Professional Environmental Recreation Consultants Ltd., 1997; Russell, 2007). It was also understood that an analysis of the city's land use data, e.g. topography, watercourses, roadways, via a GIS, could be very helpful in providing design characteristics of existing trails, although proposing new winter trail design standards premised upon such data alone may not be credible or valid in other locations or without public or trail user input into a trail planning process (Flink, Olka & Searns, 2001; State of Minnesota, 2006). There is always some level of deficiency in every

research method, or form of data collection, and therefore multiple data collection strategies need incorporation into a research project design to mitigate random errors commonly associated with research measurements (Carmines & Zeller, 1979). In order to deal with these specific methodological research issues, a mixed methods approach was used for this project.

3.2 Research Methods

The use of the mixed-method approach requires the use of at least two different methods for data collection (Tashakkori & Teddlie, 2003; Patton, 1987). For this reason, the following research methods have been used in the collection of data for this project:

1. Focused synthesis (i.e. literature review)
    - Background information
    - Data related to trail standards
    - Trail plans
2. Focus group
    - Uses on trails
    - Desires
    - Issues
    - Existing and proposed trail segments
3. Trails Task Force questionnaire
    - Quantitative data
    - Qualitative data

- Winter uses, type and frequency

The methods chosen are complimentary to one another in that where one method may not provide all the information desired one of the other methods might. A mixed methods approach uses both quantitative and qualitative data collection techniques and during analysis also allows for an integration of these methods (Tashakkori & Teddlie, 2003). In the analysis, similar results obtained from multiple methods can later assist with inferences being made from the data (Bryman & Teevan, 2005). For instance, whereas the focused synthesis method is a qualitative examination of the literature, this research can only be seen as more complete and valid with supporting data from another qualitative method (e.g. focus group) and/or supplemented by a quantitative method (e.g. questionnaires) (Bryman & Teevan, 2005). For example, unlike a questionnaire, the information derived from a focus group may provide depth and breadth to a topic area, but the information can be complex, difficult to analyze and is open to subjective interpretation (Morgan, 1988). Although a questionnaire is more structured and lends itself well to replication and easier interpretation of results, it is inflexible and not a method that can be quickly tailored within a research situation to extract more meaning (Tashakkori & Teddlie, 2003; Jennings, 2001). The mixed methods approach, therefore, attempts to mitigate the deficiencies found in each research method by using different methods that are stronger in areas where others may be weak.

3.2.1 Focused Synthesis (Literature Review)

Although similar to a literature review a focused synthesis is considered to be more appropriate than a traditional literature review when the research is project based, policy

oriented, the existing information is considered reliable, and there is a need to bring together varied sources of information and not just information that has been extrapolated from published articles (Majchrzak, 1984). The focused synthesis helps to yield preliminary ideas that can then be scrutinized later within the project itself instead of being merely a general overview of the mostly academic undertakings that have occurred in this area of research as is common to most literature reviews (Majchrzak, 1984; Cone & Foster, 1998). The focused synthesis is itself considered to be a research method capable of providing information that then can be quantified or analyzed qualitatively.

3.2.2 Focus Group

A focus group session was conducted as part of this research. This method is an excellent way to collect group conversation data between small numbers of people via a moderator, as it can, and did, result in a deep and rich data set due to the extensive interactivity that occurs among the focus group participants (Bryman, 2004). Much of the success of a focus group can depend upon the moderator being prepared and able to keep things moving along, and getting people to concentrate on the areas related to the research while at the same time allowing an organic conversation to take place (Litosseliti, 2003).

Some pitfalls of the focus group method include the domination of the conversation by an individual, inappropriate behavior by participants, and the discussion going off topic, all of which do not add to the knowledge of the topic being discussed as all of these may change behaviors and comments provided by other participants (Litosseliti, 2003). The size and makeup of the group can have similar effects. If the group is too large, not everyone may

have an adequate opportunity to participate, a participant may feel too insecure to voice an opinion in front of a large group of peers, and smaller discussions between subgroups of people may take place thereby detracting from the cohesive nature desired of the focus group session (Morgan, 1988; Stewart & Shamdasani, 1990). If the group is too small, the risk of 'pairing' may become prevalent in the discussion whereby individuals with similar thoughts pair together and control the topic and direction of the conversation (Morgan, 1988). The depth and breadth of the data obtained will also be limited due to the small size of the group (Morgan, 1988).

With eight participants, the number of Trails Task Force members that were able to attend fit well within the range of 4 – 12 participants desired in the literature for an effective focus group session (Morgan, 1988; Stewart & Shamdasani, 1990). In order to address other inherent problems associated with conducting focus groups a detailed description, both written and verbal, regarding the method, process and topic area was discussed prior to the conversation taking place. Participants were also told that they could stop the session at any time in order to ask questions or they could remove themselves completely from the session if they wished. These items were also addressed in the 'Research Information Sheet' (Appendix B) with one handed out to every participant prior to it being read and explained to the group. The general topic area for the session was also explained prior to beginning the conversation as was the approximate hour and half time limit. A skeleton outline for the session was developed to ensure that the major research areas of interest would be discussed at some point during the session (Appendix H), ensure an adherence to the time limit, to keep the participant conversation moving along, and to not leave open the opportunity for

inadvertent injection of any personal bias into the session. As there is no set agenda and merely an outline of major topics that need to be covered, the ability for flexibility in the discussion is still accommodated but structure to the session is maintained.

The data collection process of focus group research then requires the transcription of the conversations held during the sessions. There are several ways to collect the conversational data, such as note taking and video taping, but tape recording is by far the most utilized method (Morgan, 1988). Once recorded, this information must be transcribed to aid in the analysis process. Full transcription of the focus group session will provide the richness of the communication expressed during the focus group as it provides the content, in context, the flow of the conversation, and the group dynamics encountered during the event (Stewart & Shamdasani, 1990). A transcription of the focus group session was completed for analysis as part of this project and was also supplemented with notes taken during the conversation.

The results of the focus group were then analyzed via a descriptive analysis for major themes and issues of relevance to the research questions and are noted in Section 4.1. Some results of the focus group data may then be used for furthering the research via other focus groups or through other research methods such as in the development of related questionnaires in the future (Babbie, 1995).

The focus group involved members from the City of Prince George Trails Task Force (Appendix C - Trails Task Force Terms of Reference). This group is comprised of several representatives of local trails organizations such as the Caledonia Nordics, Prince George

Horse Society, Cranbrook Hill Greenway Society and the Prince George Naturalists. Aside from the representatives from these groups, there are also some other 'trails enthusiasts', i.e. public at large, members of the task force with significant experience in trail planning and use. This 'expert' sampling of the trail user group community allowed for a collection of these individual's personal experiences and perspectives, which is critical to the validity of the ensuing recommendations made for the trail standards espoused as part of this research (Morgan, 1988).

The Trails Task Force was approved by City of Prince George Mayor and Council in December 2005 with a mandate to develop a five year Trails Implementation Plan and which includes identifying multi-season trail development opportunities. Since the Trails Task Force is comprised of representatives from a variety of trail user backgrounds, the focus group members were able to provide information in relation to trail use for all times of year and express their knowledge regarding appropriate trail planning and design needed by the specific user groups which these members represent.

3.2.3 Questionnaire

The City's Trails Task Force developed a questionnaire that was distributed at public events and via the city website between September and December 2007. Prior to its distribution the questionnaire was reviewed by Alex Michalos, Director of the Institute for Social Research and Evaluation at UNBC, for clarity and relevance pertaining to the mandate of the Trails Task Force. Interest in the questionnaire was significant resulting in 314 questionnaires returned by the end of December 2007. Compiling and then quantitatively and qualitatively

analyzing such a significant amount of data greatly aided in the development of the winter trail standards contained herein.

Questionnaires are important to this research since they are the most comprehensive means of acquiring data from large numbers of individuals concerning their behaviour and/or attitudes (Veal, 1996). Questionnaires also lend themselves well to the collection of 'user group' data that can be tied to a specific site (Veal, 1996). This is an obvious advantage of such a data collection method for this type of research since responses from large numbers of trail users can be solicited via a narrow set of predefined questions, which then facilitates a quantitative analysis of the data as well as the possible generalization of results if they were to be obtained via a random sample (Baker, 1999; Neuman, 1997; Patton, 1987). The distribution method for the questionnaire in this research, e.g. open house and the web, was not a random selection of participants and so results from this method could not be generalized.

Disadvantages of the questionnaire method include the inability to explain information on the questionnaire to respondents, probing not being possible to seek in-depth qualitative responses, not all individuals being able to fill out questionnaires due to possible literacy issues, and a researcher not being completely sure who filled out the questionnaire, and how many, if they are meant to be anonymous (Patton, 1987).

To mitigate the deficiencies in this method, the Trails Task Force members and I personally handed out questionnaires wherever possible so that they could be explained to the recipient

while also having someone available to answer questions if any were to arise. The questionnaire was also pre-tested with internal city staff and the Trails Task Force to gain feedback in regards to readability, intent, length, and ease of use as well to test quantification techniques of the responses gained. This resulted in some minor formatting changes to the questionnaire prior to it being distributed on the internet and at the open house.

One of the issues of most concern was that of the online questionnaire which could be completed via an online 'clickable' form to fill out answers, respondents could also download a PDF questionnaire from the City's website, complete it, and then email, mail or drop off the completed form to City of Prince George City Hall. With an anonymous questionnaire such as this it is difficult to take note of respondents who are filling out multiple copies. One way that helps to snag these duplicate entries is to have only one person entering the data in the hopes that they may catch a similar pattern of answers between questionnaires. In light of this issue, I inputted all questionnaire data and only came across two suspected instances of two questionnaires each, i.e. two pairs of questionnaires appeared to be in almost complete agreement with one another, including comments. As they were not completely identical, and it was only four out of over three hundred questionnaires that appeared dubious, the two additional questionnaires that I may have had to destroy would not have significantly altered the results of the quantitative analysis; for this reason, and that it was not possible to determine whether or not these questionnaires were indeed completed by the same person, all returned questionnaires were utilized in the analysis.

Finally, since not everyone has a computer and is connected to the internet, several media spots and advertisements were placed indicating how to get a trails questionnaire such as by picking one up at City Hall or having one mailed or faxed to the individual.

The distribution of the questionnaire was not perfect for many of the above reasons but also because with self-directed questionnaires often only the most interested individuals take the time to seek out the questionnaire and to respond (Bryman & Teevan, 2005). This means that the sample was not random, which may have had the consequence of a skewed result. As this research is targeted at identifying trail standards, a lack of representativeness versus trail enthusiasts being the only ones taking the time to fill out a questionnaire is not a concern for this type of project as changing methods to a random survey of city residents, on the other hand and for example, may return many questionnaires, and be statistically significant, but result in limited useful data because of a lack of knowledge in such a specific subject area (Tashakkori & Teddlie, 2003). When potential respondents view a questionnaire as having importantce to them, and having possible impacts to their area of individual interest, a higher and more complete response is usually the result (Bryman & Teevan, 2005).

As shown in Figure 9, the City Trails Questionnaire has the five following questions related specifically to winter trails. The complete questionnaire is provided in Appendix D.

Figure 9 - Winter Trail Questions

On a percentage basis, during what seasons do you use the trail system?
(e.g. spring 20%, summer 50%, fall 15% winter 15%)

Spring _____%	Summer _____%	Fall _____%	Winter _____%
(April-May)	(June-August)	(Sept-Nov)	(Dec-March)

How often do you use any of the trails in Prince George in the winter? *(Please circle one letter corresponding to most appropriate answer.)*

a. Never
b. About once per month
c. About once per week
d. More than once per week
e. Almost daily

If you <u>never</u> use any of the trails in Prince George in the winter, please tell us the main reason why.

_____

_____

Which of the following activities do you engage in <u>most often</u> on the trails in winter? (*Circle one*)

a. walking/hiking
b. cycling
c. jogging/running
d. snow shoeing
e. cross-country skiing
f. other (please specify) _____

Which of the following activities would you engage in <u>most often</u> if the trails were maintained in the winter for that use? (*Circle one*)

a. walking/hiking
b. cycling
c. jogging/running
d. snow shoeing
e. cross-country skiing
f. other (please specify) _____

3.2.4 Trails Task Force Open House

The Trails Task Force held an open house on November 29, 2007. Trails Task Force questionnaires were made available at the open house along with mapping of the city's existing and proposed trail system and trail types. Specific to this research, mapping was shown indicating existing trails, proposed new trail development, and background information regarding winter trail designs, issues and opportunities within the City of Prince George.

The open house was an opportunity for residents to provide information to the Trails Task Force regarding the city's trail system including trail – related policies and proposed developments currently under discussion by the Trails Task Force. It also enabled these same residents to share with City staff their thoughts in regards to the trail system. The previously discussed questionnaire was made available at the open house and all attendees were encouraged to complete one. Comments from the public were also received on pieces of paper, on 'sticky notes', as well as written on trail maps and comment sheets.

Several Trails Task Force members, City staff, and myself were available to answer questions, take notes and hand out trail questionnaires.

3.2.5 Spatial Information (Geographic Information System)

The existing GIS database at the City of Prince George allows several layers of information to be mapped and analyzed, such as topography, watercourses, and parks which aids in determining the alignment and design characteristics of a particular trail section. The

information obtained from the focused synthesis, focus group, and questionnaires related to trail design, points of interest, level of difficulty, and specific trail characteristics was then utilized in the capability and suitability analysis of existing and proposed trails that could be used for winter recreation or commuting purposes. The purpose of this data analysis was to only show that the results obtained from the other research methods can indeed provide outputs that are useful in municipal planning practice.

3.3 Data Analysis

3.3.1 Focus Group

As noted previously, the focus group was conducted with the Trails Task Force in an attempt to acquire in-depth information related to trail development, standards and use. This qualitative research method results in deep and rich information but needs to be described or quantified in a research appropriate analysis process (Babbie, 1995; Stewart & Shamdasani, 1990); hence, once full transcription of the focus group conversations was completed a descriptive analysis was undertaken. For confidentiality reasons, the transcript is not provided in this report. See Appendix G for the focus group confidentiality agreement and protocols as well as Appendix H for the topic outline used for the session.

Descriptive analysis focuses on the details and depth of the conversation but is described via an evaluative commentary (Bryman, 2004; Patton, 1987). To that end, and specific to this research, after the focus group was completed an assessment was conducted on the range of

content that occurred during the session including some initial thoughts on what transpired. For example, the descriptive analysis can note (Patton, 1987):

- what the most diverse comments were
- what the expected and unexpected content and outcomes were of the session
- the tone of the conversation within which the participants interacted

From the descriptive analysis of the focus groups it is then possible to draw some preliminary thoughts on the research (Bryman, 2004).

3.3.2 Questionnaire

All numerical responses were quantified and graphs developed of the questionnaire results. Aside from the numerical responses, comments were also encouraged and space provided for that purpose. The written comments provided by the respondents underwent a similar analysis process as that undertaken for the focus group, i.e. transcription (Appendix E) and descriptive analysis. Due to the shortened responses encountered (e.g. one word, statements) and that the comment area was specific to a particular question (question B8) the responses lent themselves well to being quantified by theme; this would also allow for a good assessment to be made of the similarity between these data sets, i.e. numerical and written responses.

3.3.3 Trails Task Force Open House

Since many people who attended the open house provided their written comments on the available Trails Task Force questionnaires, there was a limited number of comments received on the maps, on sticky notes and comment sheets thereby allowing for a very brief summary of the comments to be undertaken (Appendix F).

3.3.4 Spatial Information (Geographic Information System)

From all the research methods used, excellent information was obtained which influenced the development of trail standards for such design characteristics as trail slope and width for winter trail uses such as cross country skiing. With that information recommendations were able to be proposed for municipal winter trail standards. The proposed standards allowed for a GIS analysis to be done of the existing and proposed trails in the City of Prince George by integrating the other existing data layers already present within the City's GIS system such as topography, environmental information, roadways, watercourses, etc. for trail capability and suitability mapping.

Results of this GIS analysis are two types of maps, one being a "Winter Trail Capability Map" and the other being a "Winter Trail Suitability Map".

The Winter Trail Capability Maps show:

- All existing and proposed trails and trail types within the City of Prince George
- Winter trails capable of specific uses based upon proposed maximum design standards criteria (e.g. slope)

- Level of difficulty per winter trail use
- Other spatial data including city infrastructure such as roads, schools, and parks as well as natural features (e.g. watercourses, topography)

The Winter Trail Suitability Map shows:

- Winter trails suitable for use based upon locational design criteria
- Buffered environmentally sensitive areas such as ungulate ranges, bear habitat, fish and waterfowl habitat
- North, west and east aspects for snow retention
- Trail loops and segments not interrupted by roadway crossings or bridges
- Proximity to residential areas
- Specific trail destinations desired by trail users (e.g. park areas, school properties, watercourses)

In the end, the quantitative and descriptive analysis of the focus group, open house and questionnaire data allowed for a much more detailed GIS analysis to take place than what would have been possible if the analysis was based primarily upon the existing city database of trail standards data only.

4.0 Analysis of Consultation Results

The following section details the results of the consultation conducted via the focus group session, Trails Task Force questionnaires and open house.

4.1 Focus Group Descriptive Analysis

The focus group session on January 17, 2008 resulted in a broad discussion in regards to the Prince George trail system and winter trail use. The session lasted approximately one hour and forty-five minutes and was attended by eight individuals from the City of Prince George Trails Task Force, plus a note taker and myself. The focus group Research Information Sheet (Appendix G) and Focus Group Session Outline (Appendix H) were handed out to all that were present and were reviewed with the group prior to the start of the discussion.

Discussion regarding the use of trails and by who was the initial topic and resulted in several comments relating to the value of trails to the public in the winter but that their use is undeniably limited due to the maintenance regime currently employed, i.e. no maintenance. The value to enable children to walk to school in the winter on maintained trails, commute to work via walking or bike, running and walking for recreational purposes, or merely as trail-based family oriented outside winter activity were all strongly supported.

Although the focus group members consider winter trails as a crucial and necessary pedestrian movement facility, the use of sidewalks as part of that trail system must also be considered in the overall planning of the trail network. Without planning for the use of

sidewalks within the winter trail system, the lack of continuity in the network would become readily apparent and would be a major deterrent to winter trail usage, particularly from a commuting perspective. It was suggested that this was because no other easy options usually exist when trail areas that could be used as pedestrian trails or trail connectors are deep with snow or covered with ice, so therefore people tend to drive.

In contrast, sidewalks appear to be well used in some locations with the reason at least partially being because they are maintained for pedestrian commuters. Furthermore, those with accessibility issues on difficult surfaces, e.g. children and those in wheelchairs, would increase their use of trails in winter if the maintenance performed on the trail resulted in better traction. What this means functionally is that in designing winter trails the standards, both design and maintenance standards, need to be based upon the specific needs of each type of winter user. Focus group members agreed that sidewalks must be cleared of snow as their function as a commuter facility is well established in Prince George. Similarly, some multi-use trails that have significant usage in the winter, e.g. Fort George Park, should also be cleared of snow to allow better accessibility for all residents. The idea of designating and maintaining pedestrian commuting routes, utilizing sidewalks and winter trails, was suggested, which should increase overall trail use based upon earlier identified concerns that identified a lack of trail maintenance as a limiting factor to increased trail use in the winter.

In contrast to the discussion regarding the snow clearing of some high use trails, a strong consensus emerged that the packing of snow on some multi-use trails is also very desirable and can be appropriate for a range of uses. Wheelchairs and electric scooters can often

negotiate hard-packed trails, and if maintained well, they do not have some of the same problems associated with the clearing of asphalt multi-use trails and the freeze-thaw regime associated with them that results in ice buildup. Thus the packing of snow can allow for a safer and more continuous use of the trail throughout the winter with the additional benefit that a higher level of maintenance is not as necessary, for example the clearing, salting and sanding of the trail surface.

Such a maintenance regime would fit well with the other focus group comments regarding the grooming of trails for cross-country skiing. Cross-country skiing can be practiced on virtually any snow surface, although 'track-setting' is the most desired maintenance standard, but also has the highest maintenance cost; for this reason the focus group members agreed that track-setting should not be a priority within a future winter trail plan for Prince George. Issues related to track-setting maintenance are many and include educating people on their appropriate use, one-way and/or two-way track-setting being necessary, trails becoming specific use versus general use, dogs on the trail, and what is the appropriate frequency of maintenance that is required. Some members were still supportive of track-setting, and therefore consideration should be given in the future to establishing a pilot project in one of the city's major parks to assess the viability of track-setting some trails within a municipal environment.

Several times the issue of easy access to winter trails came up during the session. Participants agreed that in order to increase use of winter trails in an urban environment, and trails in general, there is a need for trails to be within close proximity to people's homes.

Two individuals disagreed somewhat with this objective in that at times the journey itself and need to travel to a special destination are part of the allure of the winter trail activity. For example, a trip to a wilderness area or large designated winter trail facility can become part of the overall experience. Once again, the caveat is that the trails need to be properly developed and maintained for a winter use, whether it be hiking or skiing, in order to have people willing to make the trip. Having a variety of locations of winter trails from which people can choose the type of experience they wish to have would help in this regard such as commuter routes, inter-neighbourhood recreational trails, or destination trail loops. Since winter trails can be put in fields and other places where summer trails do not exist there are many opportunities within the City of Prince George for winter trail development. As noted by one member, the use of winter trails is really only dependent upon the maintenance.

Hence, large areas that allow continuous use and trail loops as close to home as possible were considered desired locational attributes for the provision of winter trails. Its was suggested that parks and greenbelt areas could provide the attributes for winter trail development as they are located close to many residential areas in the City of Prince George. This comment is reflective of what is currently being done in other communities for winter trail development. A 3m wide trail in the summer could equate to a 6m wide path in the winter, e.g. Foothills Boulevard greenbelt, as vegetation is not as much of an issue in some of these areas. Members also noted that complete continuity is key to increased use, meaning limited road crossings or intersections. Other more remote locations can provide for a wilderness type experience but still be close to town, e.g. Forests For The World, as one member noted that this gives people a chance to get some fresh air while providing physical and mental

refreshment outside of the urban area. These destination recreational parks are not as accessible, and therefore residents must drive to the location to enjoy the facilities meaning that maintenance of parking lots for winter trail users would be necessary.

The bulk of the discussion regarding winter trail use revolved around providing trails to permit cross-country skiing, but members universally agreed that these trails should also allow skijoring, and even dogsledding as a special event. Dogwalking on trails is an already well established activity and thus came up several times during the discussion. Therefore the use of dogs by individuals for skijoring and dogsledding was deemed just as appropriate. Due to the size and speed of some dogsled teams the trail requirements are more critical to the use and enjoyment of that activity than for most other winter trail uses. For this reason, the identification of trails that functionally may be used for dogsledding is important from a recreational or economic development perspective but does not fit within an urban multi-use winter trail system due to its incompatibility with the majority of daily trail users. For similar reasons, the development of standards and maintenance regime for equestrian use was deemed to be not necessary, as maintaining the surface and dealing with likely trail conflicts (e.g. holes in the trail, excrement) would not be worthwhile for a small number of equestrian users.

The issue of safety, aside from the trail surface, is also more prevalent in the winter months because of the colder temperatures and extended periods of darkness according to focus group members. Lighting of some of the trails was discussed to help in this regard, but such an undertaking would be very costly and, as other members noted, lighting may actually ruin

the winter trail experience for others; people can use headlamps if they desire a feeling of greater security. Having good signage and better marketing and mapping of the trails was agreed as fundamentally more necessary to increasing winter trail use and safety for all users. Such a point was also echoed during the questionnaire and open house data collection process and is consistent with the information derived from the literature as to how to provide a good and safe trail experience.

Some differing opinions emerged regarding the use of motorized vehicles on the trail system. Some agreed that limited use on the trail system, or a pilot project area, may be worthwhile, but that at the very least this use is one that should only be considered on the fringes of the city where trails lead out to regional destinations. Although Whitehorse allows snowmobiles on some urban multi-use trails, the group generally agreed that this should not be a priority in Prince George other than to allow volunteers to groom some trails by snowmobile. Snowmobile use on some city trails is a compatibility and enforcement problem and was deemed to be a safety issue. The strong negative response from the focus group members, questionnaire and open house attendees to allowing motorized use on the city's trails meant that the establishment of trail standards for snowmobiles as part of this research was judged to be not necessary. Standards for snowmobile trails are already provided in good detail elsewhere, e.g. State of Minnesota, BC Ministry of Forests.

Wrap-up comments included several mentions of Prince George being a "winter city" and thus the need to have well maintained and designated winter trails for both commuting and recreational purposes. Such winter trails need to be designed and maintained similar to the

principles used for summer trails. What this means initially is the need for the development of standards for winter trail uses at the municipal level, a plan to be developed for an integrated network of winter trails, and then a maintenance regime established for the use of such trails during the winter; these comments thus support the intent of this research.

Major themes from the focus group discussion include:

- Lack of maintenance to promote use in winter
- System of winter trails must include sidewalks
- Safety of tread surface for winter commuting and non snow-based activities is an issue
- Need for continuity of trails in the winter
- Use parks and greenbelt areas so winter trails can be continuous and wide
- Maintenance should include some clearing of snow along main commuter routes with snow packing of others
- Easy access to winter trails is needed and should be close to home but that a variety of locations is also supported such as destination winter trail locations
- Motorized trail use within the City is not supported
- No need to plan winter trails for equestrian use but dogsledding is supported as a special event
- Trail design should include loops
- No need for ski trail track-setting
- Variety in the provision of winter trails is supported

The focus group participants managed to cover all of the major research topic areas that were desired without much in the way of intervention. Most individuals have got to know each well over the last two years of the Trails Task Force, and some have known each other much longer. Thus there was a comfortableness and a high level of respect towards one another in regards to an individual's trails knowledge and the personal comments that they made. For these reasons, the focus group format only encouraged an even greater open forum of discussion, agreement and disagreement on the topics covered than what normally occurs with this group. In fact, there was agreement at the end of the session that the focus group format was so good that such a format should be considered for regular Trails Task Force meetings, as it allows for 'real' conversations to take place; as one participant noted, it is through such discussion that you manage to "personalize your own feelings" to others.

There were no major unexpected outcomes of the focus group session. Comments relating to equestrian and snowmobile trail use within the city did help with a recommendation within this report not to include such uses in the design standards for winter trails. Outcomes relating to the remainder major themes listed above were expected for the most part and are generally consistent with the results obtained from the focused synthesis, questionnaire survey and open house.

4.2 Trails Task Force Questionnaire Results & Open House

As noted in the methods section, distribution of a Trails Task Force questionnaire and holding of an open house were both conducted during the fall of 2007. Both were considered to be very successful public input sessions by the Trails Task Force members; 314

questionnaires were returned by the end of December and approximately 150 people attended the open house.

4.2.1 Questionnaire Quantitative Data Results

The quantitative results obtained from the returned questionnaires were helpful in the determination of standards of the most practiced recreational activities.

As shown by Figure 10 and Figure 11, the first two winter-related questions regarding seasonal usage and frequency of use provide excellent insight into the high level of use in the community on trails in the winter. The City of Prince George City Wide Trail System Master Plan (1998) quotes trail usage in the City at approximately 700,000 visits per year; hence having 17% of respondents in this survey noting that their trail usage occurs in the winter time (December – March) equates to a significant number of trail users (Figure 10). As shown in Figure 11, over 80% of these winter trail users are on the trail more than once per month, with almost 20% using them daily.

Figure 10 - Trail Seasonal Usage

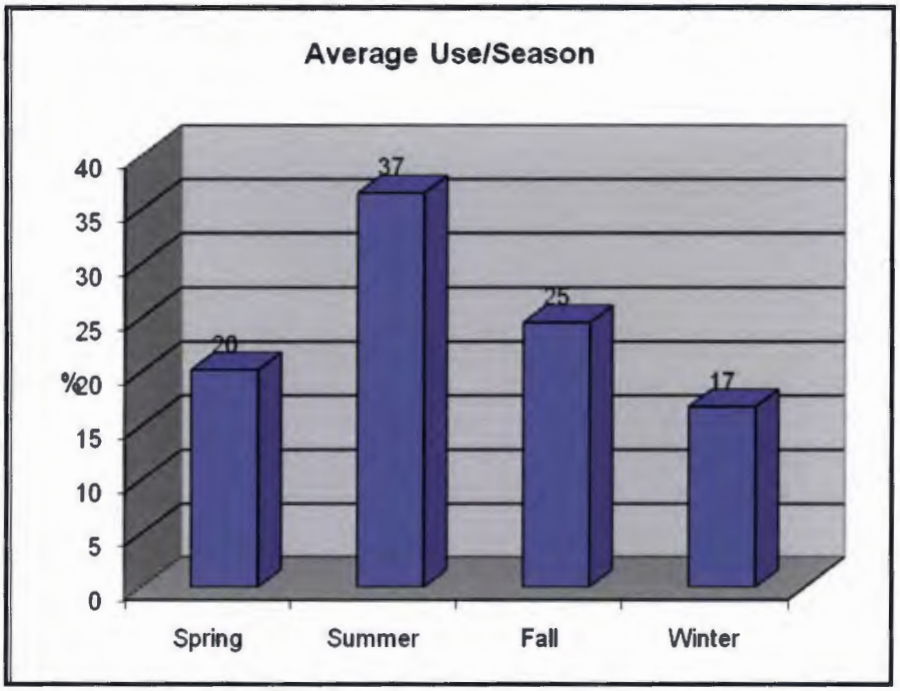
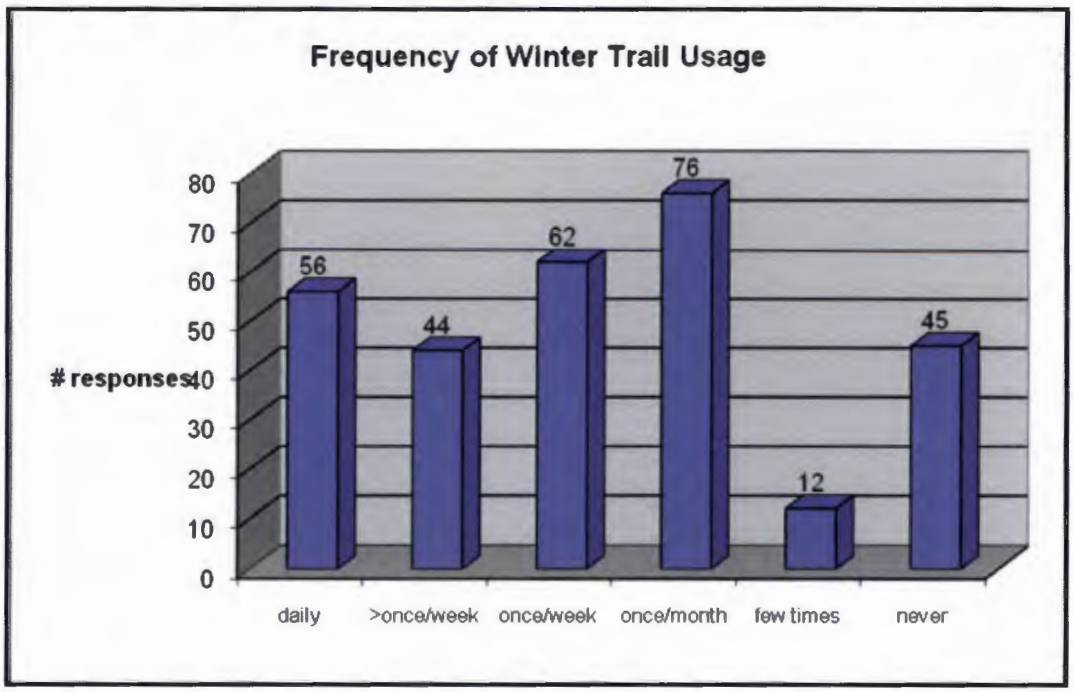


Figure 11 - Frequency of Trail Use



Both Figure 11 and Figure 12 illustrate a significant skew towards walking/hiking on the trails as current and future trail uses (if the trails were maintained for their desired use). It was somewhat unexpected the amount of skiing that is now occurring on the city's trails considering there are no designated or maintained winter trails anywhere in the city. Interesting was the increase obtained in other winter trail uses if the trails were maintained for that use (Figure 13). Such results support the comments made in the focus group that lack of maintenance is the main limiting factor to increased trail use in the winter. The results show a significant percentage increase in cycling (87%) and jogging/running (107%) on winter trails that could be attained if such trails were cleared of snow for these uses. Snowshoeing increased by 33% and cross-country skiing increased by a more modest 15%.

Figure 12 - Existing Winter Trail Activities

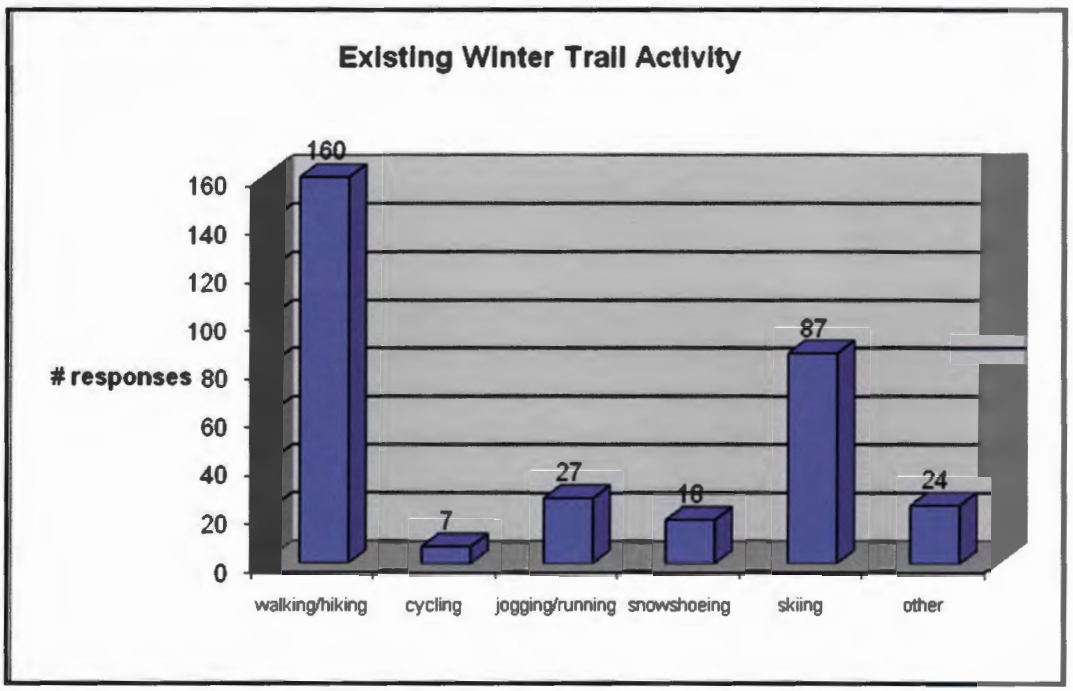
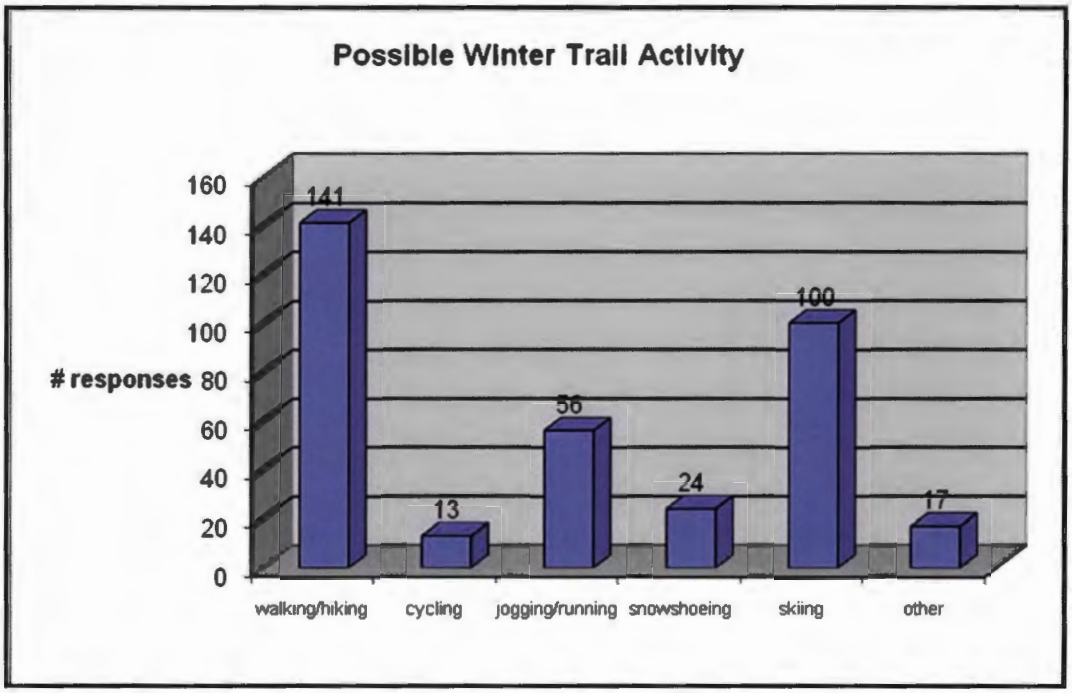


Figure 13 - Possible Winter Trail Activities

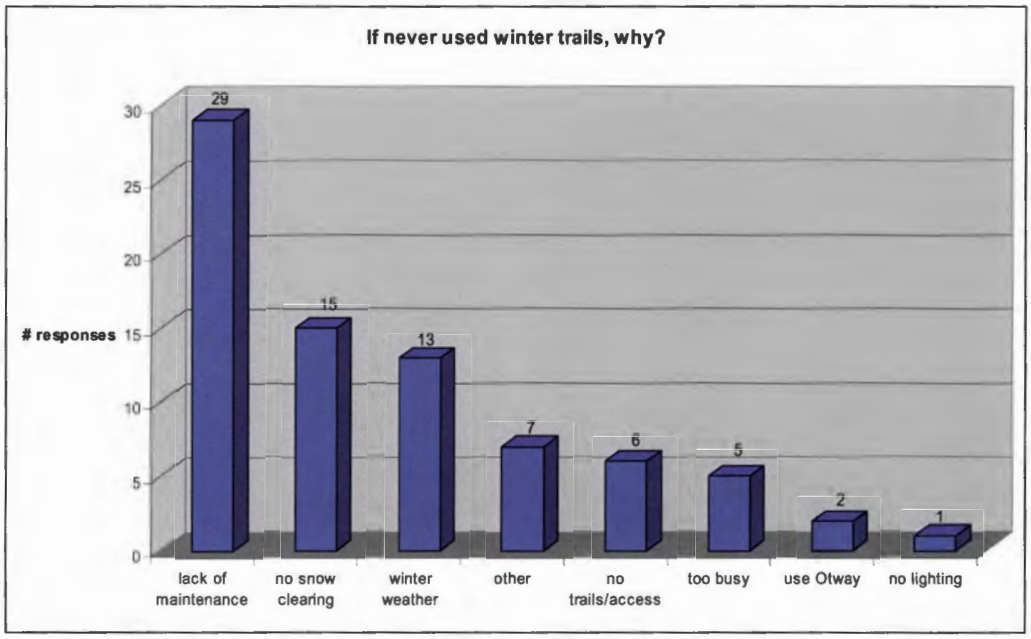


4.2.2 Questionnaire Written Response Results

The Trails Task Force questionnaire enabled respondents to write their thoughts and comments to most questions. Aside from the quantitative results obtained, of particular importance to this research were the written answers respondents gave under Part B, question 8, that if they never used the city's trail system in the winter why that was the case. A review of the content for themes via words and phrases was undertaken and out of the 74 written responses 'maintenance' was the most identified issue that was considered a barrier to their use and enjoyment of the trail system in winter. Specifically the trails were seen to have such a lack a maintenance that they were considered too dangerous to use safely for walking or running. Figure 14 shows the categories of comments received and totals for each (*Note:

although 74 written responses were obtained ,the total number of responses in the figure is 78 as some respondents provided more than one reason within their answer)

Figure 14 - Why never used winter trails?



The "lack of maintenance" category includes comments related almost exclusively to actual or perceived safety of use due to ice and snow on the trails. Others specifically mentioned that they would like the trails to be cleared of snow so that they can use them for their trail activity, e.g. walking and running.

4.2.3 Open House Written Response Results

The second set of qualitative data collected was that received at the Trails Task Force Open House. There attendees were encouraged by the Trails Task Force members to write down their thoughts and comments wherever possible, including on yellow notepads and directly

onto the poster size city trail maps that were affixed to the wall. The results are provided in Appendix F. However only two major pieces of information were obtained from respondents regarding winter trail use and those were specific to trail maintenance:

- Major trails should be plowed of snow, e.g. Fort George Park
- Other trails should have the snow packed to allow for skiing and safer walking

5.0 Discussion

An extensive amount of information has been gleaned from this research. The information translates well into three main discussion subsections and facilitates recommendations to be made in each area. A further two subsections then illustrate the recommendations made in this section. The discussion subsections are:

- Trail Purpose – Recreational Uses and Multi-use
- Winter Trail Maintenance and Structures
- Winter Trail Specifications
- Seasonal & Winter Trail Standard/Use Matrix
- Winter Trail Standards (Illustrations)

5.1 Trail Purpose - Recreational Uses and Multi-Use

The development of winter trail standards at the municipal level needs to be considered in the trail planning process. Opportunities exist for the development of winter trails alongside

existing trails, on existing trails and as part of proposed trail design and development. The standards espoused at the end of this section are proposed to be integrated into an existing trail planning regime at the municipal level. The reason for this is that many communities either already have an established trail system or a strategic plan to develop trails in the future. The driver of this research was to better understand the trail standards necessary for the enjoyment of snow-based winter recreational activities on municipal trails and to integrate those standards as much as possible into the existing trail planning framework already in use within most municipalities. Thus the establishment of new winter trail standards could be implemented as an 'addendum' to the community's existing trail plan without having to completely revisit the existing trail standards that may already be well established.

The consultation conducted for this research supported much of the previous research, city-led public consultation, and the existing seasonal trail design guidelines. In fact, the questionnaire results and focus group participants confirmed the high level of use currently occurring on the city's trails and correspondingly were unanimous in their agreement that the provision of winter trails within the municipality of Prince George is necessary. The highest standard of trail in Prince George, a city trail (3m asphalt), should be able to accommodate and be maintained for winter uses such as skiing in some areas, although snow melt is accelerated on such surfaces during sunlight and warm temperatures. Heavy use multi-use trail links, existing and proposed, should be cleared of snow to make them as barrier-free as possible but consideration should be given to packing of snow on other high use trails to promote snow-based winter trail activities. Snow packing was also deemed by the focus

group participants to be a better alternative to clearing, as in some cases snow packing results in a less slippery surface upon which to walk and run while still leaving the opportunity for skiers to use the trail. This is currently being done on 15km of multi-use trail in the City of Whitehorse with much success (D. Hnatiuk, City of Whitehorse, personal communication, October 30, 2007).

The focus group also felt that the buffer areas along the trail need to be widened to accommodate winter uses, except for motorized use. Snowmobile and ATV use on trails within the city is still a contentious issue and thus having a winter trail standard to accommodate snowmobilers or ATV's within the city was deemed to be not necessary although a site specific pilot project adjacent to the city boundary may be appropriate.

The questionnaire and open house data supported other surveys that had been done at the City of Prince George indicating a high level of resident use of the city's trail system (Michalos, 1995; Russell, 2007; Bain, 2004); approximately half of those surveyed in this project research said they use trails in the winter more than once per week. Of particular importance was the increase in interest for trying other snow-based recreational activities if some trails were maintained for that use, e.g. skiing. Increasing trail maintenance for walking and running to make trail use safer in winter was a consistent concern. Similar comments were expressed at the trails open house.

There is a need then to identify the most used trails and then differentiate between primarily commuter routes and those used mostly for recreation. What this means is that winter

recreational trail uses must be classed by trail type (Figure 17) so that the uses will not detrimentally impact upon each other and the other functions of the multi-use trail during the winter, for example, the snow cleared from asphalt trails for accessibility, seasonal-based forms of recreation (e.g. cycling), and pedestrian commuting. With some prominent asphalt trails cleared of snow, snow-based activities may then take place on other multi-use trails as these trails do not lend themselves as well to snow clearing because of their location, use, or surfacing treatment. In fact, snow-surfaced winter trails are preferable on gravel trails as snow retention and uniform coverage is better than that of asphalt (State of Minnesota, 2007). For this reason, and the need to accommodate ski trail standards, a recommendation is made to create a wider gravel trail capable of being multi-use and barrier-free but packed of snow. Such a trail could then form part of the winter trail network and be used for both skiing and walking, whether the purpose be for recreation or commuting.

The research shows that the compatibility of snow-based recreational activities on municipal trails may be in conflict at times with multi-use seasonal trail activities. These seasonal trail uses may include walkers, runners, physically challenged users and cyclists who use trails for recreational and utilitarian purposes. Thus the establishment of snow surfacing on some of these same trails may prohibit these other uses altogether or cause conflict between the trail users. All winter trails must therefore have a clear purpose as to whether or not they are going to accommodate snow-based activities. This will then help to define the appropriate trail uses and the management regime necessary to the trail's long-term success.

For example, a multi-use trail link that is utilized by pedestrian commuters and as being part of the cycling network during the snow-free months of the year may still be necessary to be maintained during the winter as well. In this case the trail link purpose is well defined as a critical link in the utilitarian trail network, and therefore recreational needs along that trail are secondary to the primary purpose. The trail tread itself will need to be cleared of snow to continue with the established utilitarian purpose but opportunities may exist for a recreational secondary use within the trail corridor, i.e. within the clearance zone, if a winter trail use standard can be met or is desired.

Similarly, some other multi-use trails may be the most appropriate sites for the establishment of a winter trail because of their surface treatment, park location, or siting within residential areas. In these cases the purpose of existing trails during the snow-free months of the year is primarily one of recreation and thus the intent of that trail purpose can be kept during the winter via the establishment of a winter trail. Unless a multi-use trail corridor connecting to specific major destinations serves a dual purpose as recreation/utilitarian trail then these neighbourhood links should be maintained as a winter use trail. Exceptions to this would be trail/walkway connections to shopping centres, schools or transportation hubs; such connections must also be barrier-free hence necessitating the snow removal of these links. Although it was expressed during the focus group session that hardpacked snow covered trails may still be able to be effectively used by those in wheelchairs, the sometimes slippery snow surface may deter others who are mobility challenged.

Use of the Benefits-Based philosophy should be used to aid in the determination of the trail purpose based on the trail's role in community sustainability, quality of life, physical activity, climate change programs, etc. As a comprehensive planning approach the BB philosophy fits well within the integrated, strategic and sustainability practices and policies and programs now being put in place at the municipal level.

Trail Purpose Recommendations

1. Every existing and proposed trail in the network must have a defined purpose; based not only on trail type but also on existing use and its role in the municipal non-motorized transportation plan;[1]
2. Transportation/utilitarian use only trails must be cleared of snow during the winter;
3. Trail links/walkways connecting to schools and major points of interest (e.g. shopping centres, transportation hubs) should be cleared of snow;
4. Winter trails must be recognized in municipal land use plans to protect their long term viability;
5. Until specific use trails are developed, all winter trails are considered to be multi-use and are to be snow packed;
6. Use of the Benefits-Based planning philosophy will help in determining a trail's purpose and management within the municipal level recreational and transportation systems.

[1] Trail type refers to the standard of which the trail is developed, i.e. trail classification. The overall management intent and maintenance regime determines the purpose, or function, for which the the trail will be used. It is the trail purpose that defines the type of trail that should be developed.

5.2 Winter Trail Maintenance & Structures

An active and scheduled maintenance regime is required for winter trails, so that the trails can continue to meet their intended purpose as noted as the major concern in the questionnaires. Trails with too much snow that has not been packed or groomed in some time will not enable people to walk or ski on it. Trails with too much ice will also make negotiating the trail by any means difficult and dangerous. Regular maintenance allows for the removal of downed trees, repairs to signage and even adjustments to be made in the trail classification if changes to the trail have taken place, e.g. ice, erosion, significant snowfall, trail regrading, etc. Maintenance would need to be carried out by a properly trained and specially equipped machine, such as a snowmobile and drag or motorized snow groomer, both of which are able to pack snow as well as reduce ice build-up. Training courses and guides are available that detail the proper operation of these machines for snow grooming under various conditions, although the minimum snow depth to start snow packing with equipment is 10cm (International Association of Snowmobile Administrators, 2005; State of Minnesota, 2006). Several communities researched have agreements with local recreation groups to maintain their winter trails and as this has been noted as working, well it should be explored in other communities as well.

Structures that are in place for seasonal trail uses during the snow-free months of the year can be used as part of the winter trail system, e.g. bridges. Appropriate bridge design on trails is to match the width of the bridge with the tread width of the trail so that 'pinch points' are not created (Flink, et al, 2001). Although some ski trail standards require extra clearance zone

widths well beyond that of the width of a typical multi-use trail, pinch points at these bridge crossing locations in the winter is acceptable due to the mostly recreational purpose of the winter trail system. If hosting of ski competitions becomes of greater interest on these trails then replacing these bridges with those matching the Cross Country Canada design criteria may be necessary.

Crossings of city roads and natural features such as streams or wetland areas are often necessary. Keeping up a snow-base for winter activities that rely on snow is critical to the increased overall enjoyment and continuity of the winter trail system. To that end, for the crossing of city roads, a pedestrian overpass infrastructure is desired so that an accumulation of snow can occur and snow maintenance is possible. If an overpass is not possible, the trail crossing should occur at roadway intersections where sitelines are good and regulatory and warning signage exists (State of Minnesota, 2006). Bridges on trails may be necessary where small water crossings are unavoidable and have perennially flowing water. If water is deeper than 15cm and not capable of freezing solid to that depth then a bridge crossing is necessary (British Columbia Ministry of Lands and Parks, 2005). Bridge design criteria include designing bridges with at least 3m in width, which will allow snow grooming equipment to fit over the bridge. Bridges of this size will also need to be engineered to allow for at least five tons of weight associated with the snow, structure and grooming equipment (Baughman & Rathke, 2003). It should also be noted that unless it is critical to connectivity, or to gain access to a prominent points of interest, it is not recommended to cross lakes or wetland areas with a winter trail due to potential environmental impacts related to snow grooming equipment and the safety hazard that may exist for trail users and equipment operators

(Colorado State Parks & Hellmund Associates, 1998; British Columbia Ministry of Lands and Parks 2005).

Access to trailheads for the maintenance equipment is also necessary while keeping out unwanted motorized vehicles prohibited on these trails. For this reason the use of at least three bollards at the entrance to the trailhead is necessary, whereby the bollards can be locked and then removed by City staff which would then allow a cleared distance of at least 2m for snowmobiles and 3m for groomers (State of Minnesota, 2007).

Provision of trail and use appropriate signage was a major topic during the focus group session and is discussed at length in the literature (State of Minnesota, 2007; Flink et al, 2001; British Columbia Ministry of Forests, 2000). The British Columbia Ministry of Lands and Parks trail standards are well referenced in other trail planning documents (e.g. Ministry of Forests Recreation Manual, Township of Spallumcheen Trails Masterplan, City of Kimberly Trails Master Plan) and address issues regarding trail difficulty levels and appropriate use as well as signage (2005). Due to their extensive use and simplicity regarding installation and maintenance, it is proposed that ground-based signs with visual illustration of the activity permitted for the particular trail be used. The City of Whitehorse has such a standard taken from the Trans Canada Trail signage guidelines for use on their winter trails as shown in the examples in Figure 15 below (Inukshuk Planning and Development, 2007).

Figure 15 - Winter Trail Signage (City of Whitehorse)

Such signage should include, at a minimum, the name of the trail, permitted uses, and trail length. Trailhead signage as shown in Figure 16 is also necessary as it provides detailed information regarding the type of trail, trail routing and network information, interpretive information, use guidelines and safety information. These signage recommendations flow from the literature but also from the information gleaned from the questionnaires, open house and focus group for more and better signage to allow for easier use of the trail system but also for safety purposes, so trail users are not getting lost or disoriented on the trail during the coldest time of the year.

Figure 16 - Trailhead Signage

Maintenance and Structures Recommendations

1. A permanent and regular maintenance regime is required to meet the intended recreational purpose of the winter trail system;
2. A snowmobile with drag is necessary, at a minimum, for grooming (packing) a winter trail. A motorized trail groomer is preferred;
3. Bridge width needs to match trail tread width (3m minimum);
4. Bridges are required over free-flowing watercourses;
5. Trails should be avoided over lakes and wetland areas;
6. Overpasses and intersections are preferred for trail road crossings;
7. Use of BC Parks and Trans Canada Trail signage standards are recommended;
8. Partnerships between municipalities and winter recreation user groups should be explored for the maintenance of winter trails.

5.3 Winter Trail Specifications

From the review of the literature, public input and focus group, the functional requirements for specific winter uses on municipal trails were determined. Trail specifications can include trail width, slope, snow depth, curve radius, surfacing, clearance zones, and elevation gain.

First, from this research it was determined that two additional multi-use trail standards should be considered by winter city municipalities such as Prince George. Currently the multi-use trail standard is of 3m width and of an asphalt surface; however several communities researched suggest a 4m wide asphalt multi-use trail for high use areas, so that bidirectional trail traffic can safely pass at speed, and even a greater width (e.g. 5m) should be considered if cyclists are not separated from other pedestrian traffic (State of Minnesota, 2007; Flink, Olka & Searns, 2001; Stantec Consulting, 2007). A 4m wide tread surface and associated 1m buffer zone on each side, for a 6m clearance zone, would permit all of the snow-based winter activities to take place as discussed in this research. Such trails though have an asphalt surface, which does not lend them well to the retention of snow. Such high use trails should be packed of snow, as in the winter they often carry the most number of utilitarian users and those that require barrier-free access (State of Minnesota, 2007). Nevertheless, at least the possibility does exist for snow-based recreation special events to take place on such a trail if desired, e.g. dogsledding and skijoring races. As this trail type is not proposed as a winter trail, a standard specification sheet is not provided.

Since the 4m asphalt trail above should always be cleared of snow, and is purely utilitarian in purpose, a second new trail standard is proposed, a 3m wide multi-use gravel surfaced trail.

Having a slightly smaller clearance zone than that of the 4m asphalt trail standard at 5m in total clearance width, but able to retain snow better than asphalt, this trail standard will still allow for bidirectional recreational skiing such as freestyle/skate skiing in one direction and classic skiing in the other direction (BC Ministry of Forests, 2000; State of Minnesota, 2007). Although this trail width may not be sanctioned for formal cross-country skiing events, this standard will easily allow all other uses as well as dogsledding and skijoring events to take place and to be sanctioned by the International Sled Dog Racing Association (2002).

As evidenced above, the planning for clearance zones is more critical to the functioning of winter trails than that of the seasonal trail uses. During the snow-free months of the year, the total clearance zone permits better visibility and safety for a well defined trail tread. For winter trails the clearance zone is the most important design characteristic that allows for the greatest use of the existing trail for snow-based activities.

Also what must not be forgotten is the buffer zone area that is aside the clearance zone, as it is the buffer zone that provides most of the aesthetic appearance to the trail corridor and the 'feel' that trail users get while recreating there (Baughman & Rathke, 2003). Avoidance of long and steep grades, but yet periodic short but moderate undulations in the trail, should be sought in the design to provide additional interest to the user (State of Minnesota, 2006). Similarly, winter trails should be offset from roadways by a minimum of 4m to reduce the spray of slush, snow, and gravel onto the trail tread. This design will not only enhance the user experience but also increase safety and reduce trail maintenance.

Although the level of interest is minimal in snowshoeing, according to the results obtained from the focus group and Trails Task Force questionnaire, multi-use winter trails allow for snowshoeing to take place, as it is not in conflict with other similar uses such as walking and running on these trails. Snowshoers, however, may find the more urban locations of these trails not befitting of a primarily backcountry recreational activity. Furthermore, ski track setting is not compatible with snowshoeing use on the same trail but since few communities in the literature note that they undertake such maintenance on major multi-use trails this is an issue that need not be addressed in this research.

A 'trail difficulty rating system' may need to be considered as part of an extensive winter trail network. As noted in the literature, such rating systems are used elsewhere with great effect to limit liability, increase user awareness, and deter unsafe use (British Columbia Ministry of Lands and Parks; State of Minnesota, 2006). The BC Ministry of Lands and Parks (2005) and the International Mountain Biking Association both recommend a simple three level rating system that can be illustrated visually through signage with colours and shapes, e.g. 'easy' (green dot), 'more difficult' (blue square), and 'expert' (black diamond) (Train, 2004). If a municipality will only be maintaining its multi-use trails for winter use, and those trails meet the 'easy' winter trail criteria as shown in Figure 17, then it is not necessary to utilize a trail rating system. That is to say, if a winter trail standard other than 'easy' is utilized, then an urban trail rating system is recommended (State of Minnesota, 2007). For specific trail areas warning or caution signs should be posted as necessary due to specific undulations in terrain, turning radius, other uses, road/trail crossings, etc. As the

winter trail system expands a trail difficulty system would be required if a variety of trail types and difficulties are planned.

The following figure provides the preferred trail criteria for two-way skiing and dogsledding/skijoring on municipal trails.

Figure 17 – Winter Trail Use Specifications & Difficulty Rating

	Skiing			Dogsledding/Skijoring
	Easy	**Intermediate/More Difficult**	**Expert**	
Preferred Grade	0 - 4%	9% - 18%	10% - 20%	9% - 18%
Maximum Grade	10%	25%	40%	25%
Average Grade	0% - 6%	6% - 12%	>12%	<10%
Curve Radius	15m – 30m	15m	15m	15m – 30m
Elevation Gain	<20m	20m – 75m	75m – 1500m	20m – 75m
Correlating Prince George municipal trail standard	City Trail	City or Local Trail	Local or Rustic Trail	City or Local Trail
Preferred Trail Width (Clearance Zone)	5	4	3	5

Recommendations

1. A new 4m wide asphalt multi-use trail standard, delineated and bidirectional, be implemented as part of a future trail standards review:

a. New 4m asphalt standard to be included in the City of Prince George City Wide Trail System Master Plan and be cleared of snow in the winter;
b. Trail to be cleared of snow in the winter but may be able to be used for winter snow-based special events, i.e. skiing competitions (bidirectional freestyle competitions and dogsledding and skijoring races);
c. Trail to have 6m minimum clearance zone.

2. Existing 3m wide asphalt multi-use trail (i.e. City Trail) should be cleared of snow in winter to allow barrier-free access and uses that are both recreational and utilitarian;
3. A new 3m wide gravel trail standard be implemented as part of a future trail standards review and be maintained as a winter trail (Figure 19):
    a. New 3m gravel trail standard to be included in the City of Prince George City Wide Trail System Master Plan;
    b. Trail to be of groomed snow in winter;
    c. Trail to have a 5m minimum groomed clearance zone;
    d. Trail appropriate use includes walking and bidirectional recreational freestyle and classic skiing, and skijoring;
    e. Trail standard allows for dogsledding and skijoring special events/races.
4. Existing 2m wide gravel trails (i.e. local trails) be maintained as a winter trail (Figure 20):
    a. Trail to be of groomed snow in winter;
    b. Trail to have a 4m minimum groomed clearance zone;
    c. Trail appropriate uses include walking and bi-directional classic skiing.

5. Natural (i.e. rustic trails) do not need to be maintained for winter trail use:
    a. Trail appropriate uses include snowshoeing and backcountry skiing;
    b. Unless maintained in winter no trail difficulty rating is necessary for this trail standard. If maintained in winter, a trail difficulty rating of "expert" should be given;
6. 'Informal' trails should not be maintained for winter use, as such maintenance would detract from the experience desired by winter trail users.
    a. If maintenance is desired for an informal trail it must first be brought up to an appropriate city standard and maintenance regime formulated.
7. To reduce maintenance and increase quality of trail surface (e.g. trail devoid of gravels, ice, road spray), winter trails should be offset from roadways by 4m.
8. A three level winter trail rating system is recommended based on the skiing criteria provided in Figure 15; if winter trails other than 'easy' are proposed:
    a. "easy" (filled green circle);
    b. "more difficult" (filled blue square);
    c. "expert" (filled black diamond).
9. Signage is required for all winter trails:
    a. Informational/trailhead signage, e.g. mileage markers, interpretive signage;
    b. Regulatory signage, e.g. no motorized use;
    c. Warning signs, e.g. corner, steep hill.
10. Snowshoeing is a permitted activity on all municipal winter trails where ski track-setting is not being undertaken;

11. Ski track setting is not a priority on multi-use winter trails. Track setting should only be considered on specific-use trails and in parks to avoid user conflicts and maintenance issues.
12. Trail looping is desired wherever possible.
13. South-facing slopes should be avoided for winter trail development to minimize snow loss due to sunshine and heating effects encountered on the south aspect.
14. Asphalt trails should be avoided for winter trail development as they are heat stores and increase rates of snow loss.

5.4 Seasonal & Winter Trail Standard/Use Matrix

The matrix shown in Figure 18 is an integration of trail uses with existing and proposed trail standards on a monthly (seasonal) basis. The intent is to show how municipal trail standards can be utilized and trails maintained to allow for winter recreational activities to take place. The management regime is based upon trail usage, trail type and trail purpose.

Figure 18 - Trail Standard, Seasonal Use & Maintenance Matrix

Trail Surface	paved	paved	gravel	gravel	rustic	informal
Tread Width	4m*	3m	3m*	2m	1m	1m *
Clearance Zone	6m	5m	5m	4m	3m	n/a
July	maintained	maintained	maintained	maintained	maintained	unmaintained
August	maintained	maintained	maintained	maintained	maintained	unmaintained
September	maintained	maintained	maintained	maintained	maintained	unmaintained
October	maintained	maintained	maintained	maintained	maintained	unmaintained
November	cleared	cleared	groomed 5m	groomed 4m	unmaintained	unmaintained
December	cleared	cleared	groomed 5m	groomed 4m	unmaintained	unmaintained
January	cleared	cleared	groomed 5m	groomed 4m	unmaintained	unmaintained
February	cleared	cleared	groomed 5m	groomed 4m	unmaintained	unmaintained
March	cleared	cleared	groomed 5m	groomed 4m	unmaintained	unmaintained
April	maintained	maintained	maintained	maintained	maintained	unmaintained
May	maintained	maintained	maintained	maintained	maintained	unmaintained
June	maintained	maintained	maintained	maintained	maintained	unmaintained
Winter Trail Use	walking / cycling / accessible	walking / cycling / accessible	walking / freestyle & classic skiing / skijoring / dogsledding	walking / classic skiing	snowshoeing / backcountry skiing	snowshoeing
Direction of Travel	Two-way separated (painted line)	Two-way	Two-way	Two-way	n/a	n/a

Note* - The 4m paved, 3m gravel and 1m informal trails are not recognized standards by the City of Prince George. Only the 3m gravel standard (5m clearance zone) is recommended to be adopted by the City of Prince within the City Wide Trail System Master Plan and that those developed links be subsequently maintained for winter use.

5.5 Winter Trail Standards (Illustrations)

The following winter trail standards have been developed from the recommendations contained within this project report.

- 3m Asphalt (City Trail) Snow Cleared Multi-Use Trail
- 5m Groomed Winter Trail Standard Trail
- 4m Groomed Winter Trail Standard
- 1m Winter Rustic Trail Standard (unmaintained)
- Winter Informal Trail (unmaintained)

Figure 19 – 3m Asphalt (City Trail) Snow Cleared Multi-Use Trail (Illustration)

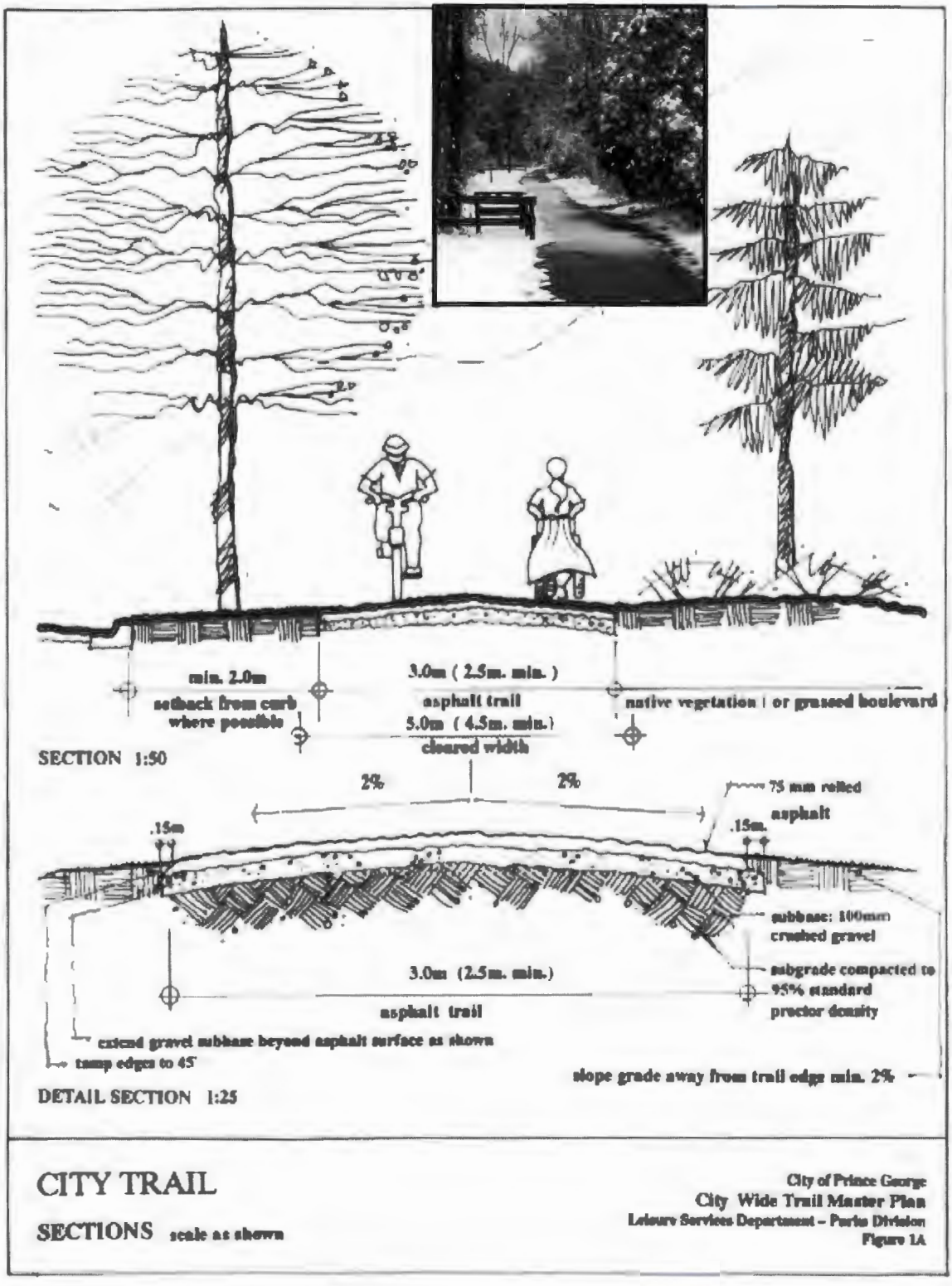
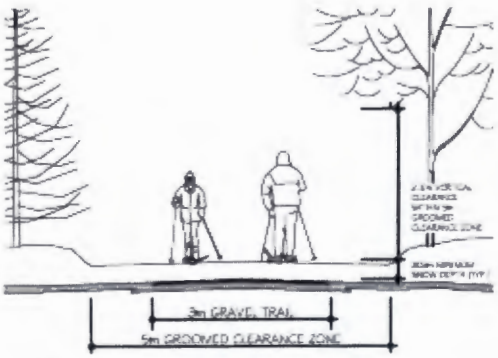


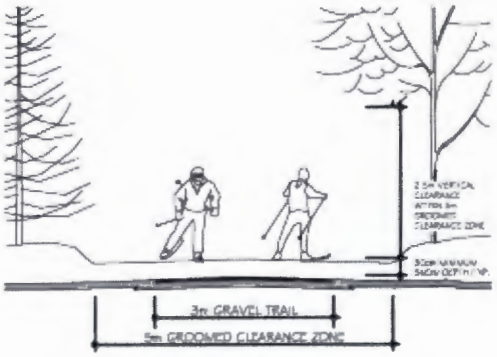
Figure 20 – 5m Groomed Winter Trail Standard (Illustration)

5m WINTER TRAIL STANDARD

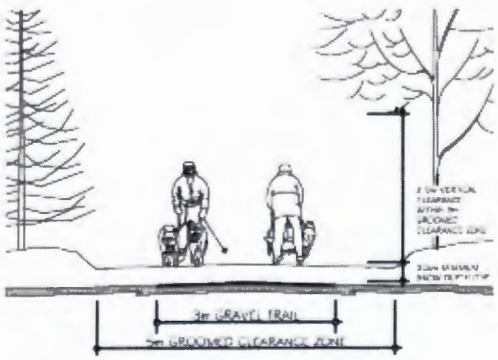
USES: Classic & Freestyle Skiing, Dogsledding, Skijouring & Walking



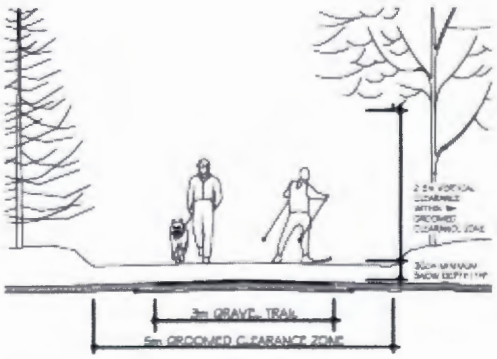
CLASSIC STYLE (Traditional)
RATING: EASY
ONE OR TWO DIRECTIONS



FREESTYLE (Skate)
RATING: EASY
ONE OR TWO DIRECTIONS



DOGSLEDDING or SKIJOURING
ONE OR TWO DIRECTIONS



MULTIPLE USE
ONE OR TWO DIRECTIONS

WINTER TRAIL USE	Skiing			Dogsledding/Skijoring
	Easy	Intermediate/More Difficult	Expert	
Preferred Grade	0 - 4%	9% - 18%	10% - 20%	9% - 18%
Maximum Grade	10%	25%	40%	25%
Average Grade	0% - 6%	6% - 12%	>12%	<10%
Curve Radius	15m – 30m	15m	15m	15m – 30m
Elevation Gain	<20m	20m – 75m	75m – 1500m	20m – 75m
Correlating Prince George Municipal Trail Standard	City Trail	City or Local Trail	Local or Rustic Trail	City or Local Trail

Figure 21 – 4m Groomed Winter Trail Standard (Illustration)

4m WINTER TRAIL STANDARD

USES: Classic Skiing & Walking

CLASSIC STYLE (Traditional)

RATING: INTERMEDIATE / MORE DIFFICULT

ONE OR TWO DIRECTIONS

WALKING

ONE OR TWO DIRECTIONS

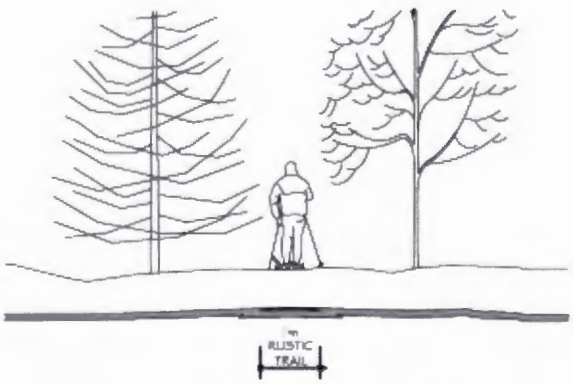
WINTER TRAIL USE	Skiing			Dogsledding/Skijoring
	Easy	Intermediate/More Difficult	Expert	
Preferred Grade	0 - 4%	9% - 18%	10% - 20%	9% - 18%
Maximum Grade	10%	25%	40%	25%
Average Grade	0% - 6%	6% - 12%	>12%	<10%
Curve Radius	15m – 30m	15m	15m	15m – 30m
Elevation Gain	<20m	20m – 75m	75m – 1500m	20m – 75m
Correlating Prince George Municipal Trail Standard	City Trail	City or Local Trail	Local or Rustic Trail	City or Local Trail

Figure 22 - 1m Winter Rustic Trail Standard (Illustration)

1 m WINTER TRAIL STANDARD

UNMAINTAINED TRAIL
USES: Snowshoeing & Backcountry Skiing

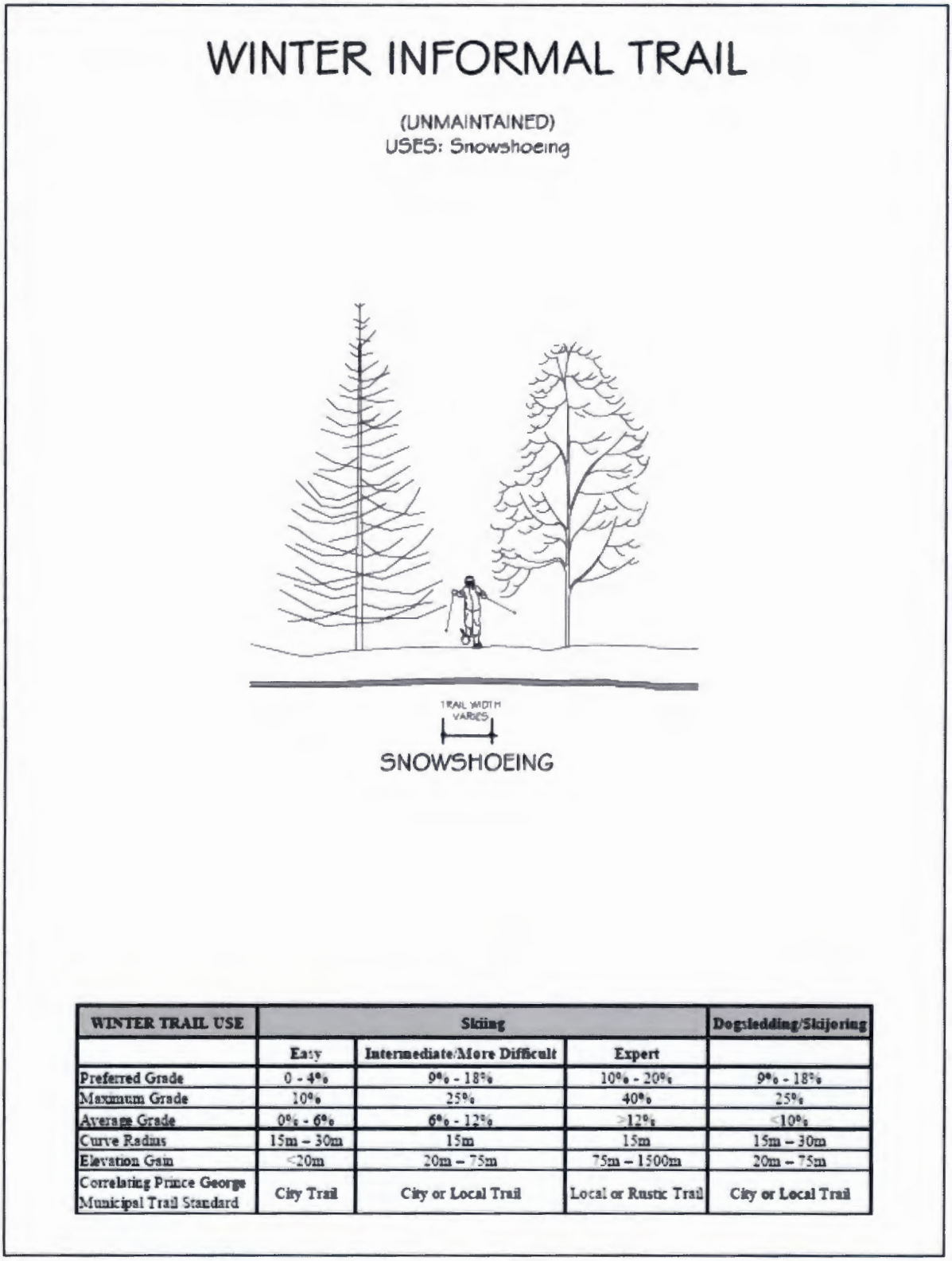
SNOWSHOEING



BACKCOUNTRY SKIING

WINTER TRAIL USE	Skiing			Dogsledding/Skijoring
	Easy	Intermediate/More Difficult	Expert	
Preferred Grade	0 - 4%	9% - 18%	10% - 20%	9% - 18%
Maximum Grade	10%	25%	40%	25%
Average Grade	0% - 6%	6% - 12%	>12%	<10%
Curve Radius	15m – 30m	15m	15m	15m – 30m
Elevation Gain	<20m	20m – 75m	75m – 1500m	20m – 75m
Correlating Prince George Municipal Trail Standard	City Trail	City or Local Trail	Local or Rustic Trail	City or Local Trail

Figure 23 - Winter Informal Trail (Illustration)



WINTER TRAIL USE	Skiing			Dogsledding/Skijoring
	Easy	Intermediate/More Difficult	Expert	
Preferred Grade	0 - 4%	9% - 18%	10% - 20%	9% - 18%
Maximum Grade	10%	25%	40%	25%
Average Grade	0% - 6%	6% - 12%	>12%	<10%
Curve Radius	15m – 30m	15m	15m	15m – 30m
Elevation Gain	<20m	20m – 75m	75m – 1500m	20m – 75m
Correlating Prince George Municipal Trail Standard	City Trail	City or Local Trail	Local or Rustic Trail	City or Local Trail

5.6 Limitations of the Research

Although the focused synthesis is an excellent way to gather information for a research project it is also difficult to track down reports, plans and articles that are not always categorized or available to the public via traditional data sources such as libraries or research databases. Unlike academic articles and books that are catalogued and searchable many of the documents utilized in this research were sought and obtained through professional contacts, community websites, email, Council minutes and a personal knowledge of information available via the community trail and park planning profession. With greater financial resources an opportunity to expand the research scope would have been possible and allowed more community site visits, surveys, interviews and focus groups as well as the ability to obtain other trail planning documents. Considering these difficulties, the information that was obtained via personal visits to communities, phone calls with planners, and the interaction and data obtained from questionnaire respondents and focus group participants was very informative, specific to the research topic, and extremely valuable to the legitimacy of this research.

As noted earlier, since random sampling was not done for the questionnaire generalizing of the results obtained from that method is not possible. Even with the significant response obtained, without random sampling the questionnaires and data results could not be deemed to be statistically significant, i.e. representative of a larger population (Cone & Foster, 1998). Although a mixed-methods approach was used to increase the reliability of the research and mitigate the disadvantages of each research method chosen a future random sample of winter

trail users via a questionnaire or interview would increase both reliability and validity of the research and possibly allow for generalization of the results.

6.0 City of Prince George Winter Trail GIS Analysis

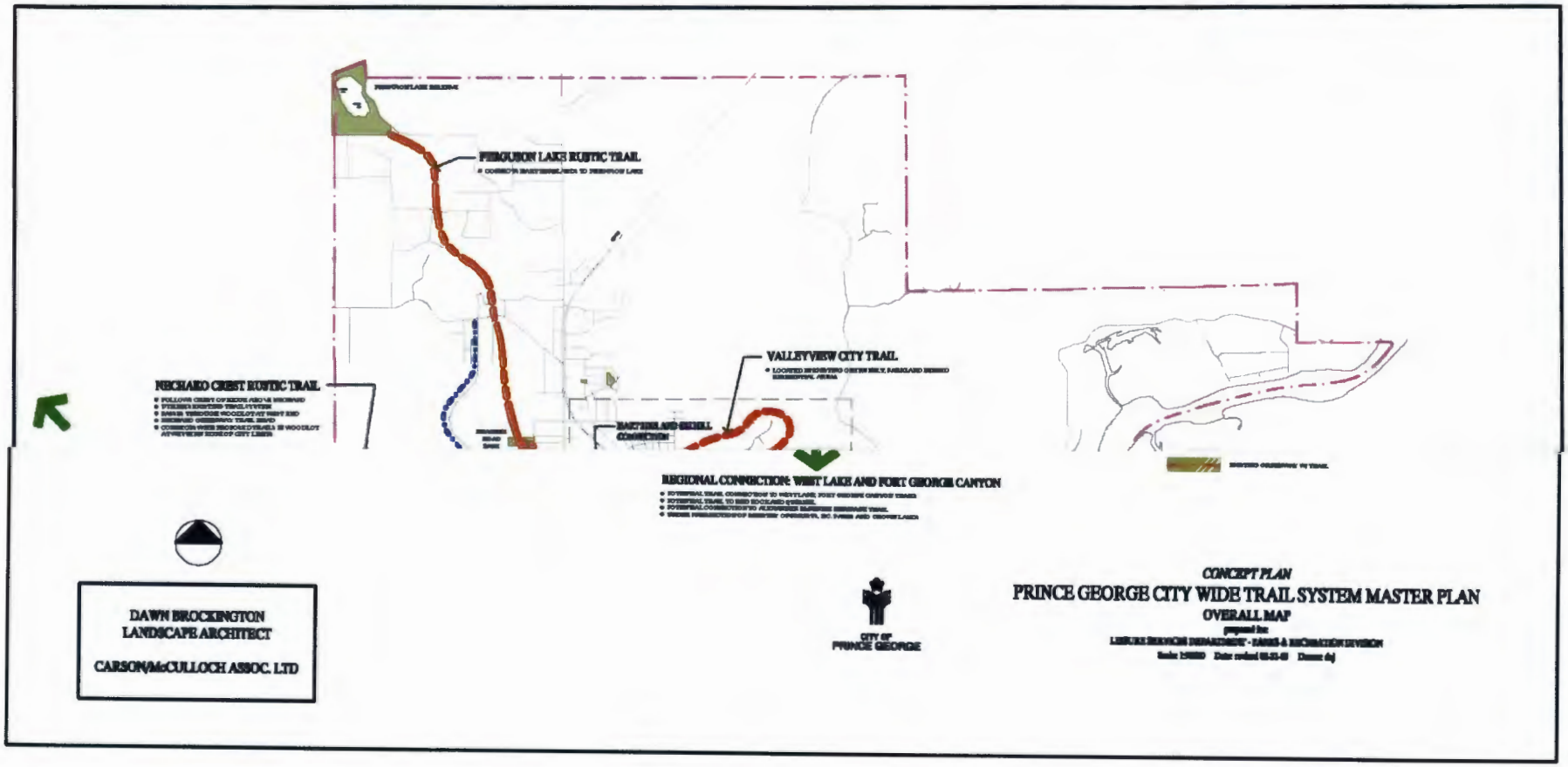
The intent of this section is to illustrate how the recommended winter trail standards could be used for planning purposes via a GIS analysis on an existing and proposed municipal trail system. As the site of the research methods for this project, and that it is a winter city with approximately 200kms of existing and proposed trails (Figure 24), the City of Prince George makes for an excellent mapping example regarding the implementation of these proposed winter trail design standards. Although the city's City Wide Trail System Master Plan briefly notes that the trails proposed in the plan may be used for cross country skiing, there is no further discussion in regards to such use being accommodated through use-appropriate trail design standards or necessary maintenance regime. Since the existing and proposed trails for Prince George were not designed for winter uses, the city's trail system makes for an interesting analysis of how an existing municipal trail system may be able to accommodate snow-based trail activities using the recommended winter trail design standards. For those reasons, trail capability maps and a suitability map have been developed via a Geographic Information System to show which trails can be utilized by which winter uses based upon the proposed trail standards taken from this research. In order to better illustrate the results of the analysis for the capability maps, it was necessary to divide the city into three districts:

1. Cranbrook Hill/Downtown/College Heights

2. Blackburn

3. Hart

Figure 24 - Prince George City Wide Trail System Master Plan



6.1 Winter Trail Capability Maps

The development of the capability maps for the City of Prince George involved a two step analysis process for each one of the three districts in the City and based on the following criteria.

1. Slope analysis for all existing and proposed trails. Maps titled: *Winter Trail Slope Analysis*
2. 'City' and 'Local' trails (existing and proposed) with less than 25% slope.Maps titled: *"City" and "Local" trails with less than 25% slope*

The Winter Trail Slope Analysis maps were created by using an existing digital elevation model (DEM) of the City of Prince George, trail alignment data from the Prince George City Wide Trail System Master Plan, and existing trail as-built drawings. The intent of the slope analysis of all of the city's existing and proposed trails is to show which trail segments fit within the slope categories espoused for snow-based winter trail activities garnered through this research. The maximum slope for each ski difficulty rating and trail use as per Figure 17 was used. For example:

- Easy: 0 – 10% (maintained – walking, skiing, skijoring, dogsledding)
- Intermediate: 10 – 25% (maintained – skiing, skijoring, dogsledding)
- Expert: 25 – 40% (unmaintained – skiing)
- >40% (dangerous/off-limits)

The results of this first analysis illustrated the considerable variation of grades along most trail segments in the City. Although many trail segments had numerous grade changes

between the four trail difficulty levels there were also significant stretches of trail of which only 'easy' and 'intermediate' grades dominated the trail segment. 'Expert' and 'dangerous/off-limit' grades were encountered in some areas, specifically near escarpments and riverfront areas. Even so, some of the 'dangerous/off-limit' grades were very small and localized therefore creating the possibility that the existing or proposed trail alignment in that area could be rerouted or the grade change could be lessened through minor trail reconstruction. Overall the trail capability maps showed many areas capable of winter trail development and maintenance as per the standards proposed.

The slope analysis was then refined in the second stage of GIS analysis. Since only 'City' and 'Local' trails meet the recommended research standards for winter grooming and maintenance it is those trails which will be analyzed to show the capability of the city's existing and proposed trails that could actually be utilized for snow-based winter activities. The maximum slope of 25% is thus used in this second stage of analysis as trail segments which meet that criterion could be rated for either beginner or intermediate level trail users, accommodate winter trail multi-uses, and are able to be maintained for those uses. For example:

- City Trail: 3m paved asphalt tread surface, easy winter use rating, 5m clearance zone, 5m groomed tread, 0 – 10% grade (walking, two-way freestyle and classic skiing, skijoring, skijoring and dogsledding special events)
- Local Trail: 2m gravel tread surface, intermediate winter use rating, 4m clearance zone, 4m groomed tread, <25% grade (walking, two-way classic skiing)

The results of this analysis show the significant number of kilometres of trail that could be utilized by many winter users. According to the analysis all the districts of the City could have an inventory of developed and maintained winter trails segments and loops. In particular the Blackburn Loop, Valleyview Loop (Hart), and several neighbourhood loops in the Cranbrook Hill area could easily accommodate winter trail development based on slope and trail width, i.e. City or Local trail standard.

Figures 25 to 30 are the capability maps created from this GIS analysis.

Figure 25 – Winter Trail Slope Analysis (Cranbrook Hill, Downtown, College Heights)

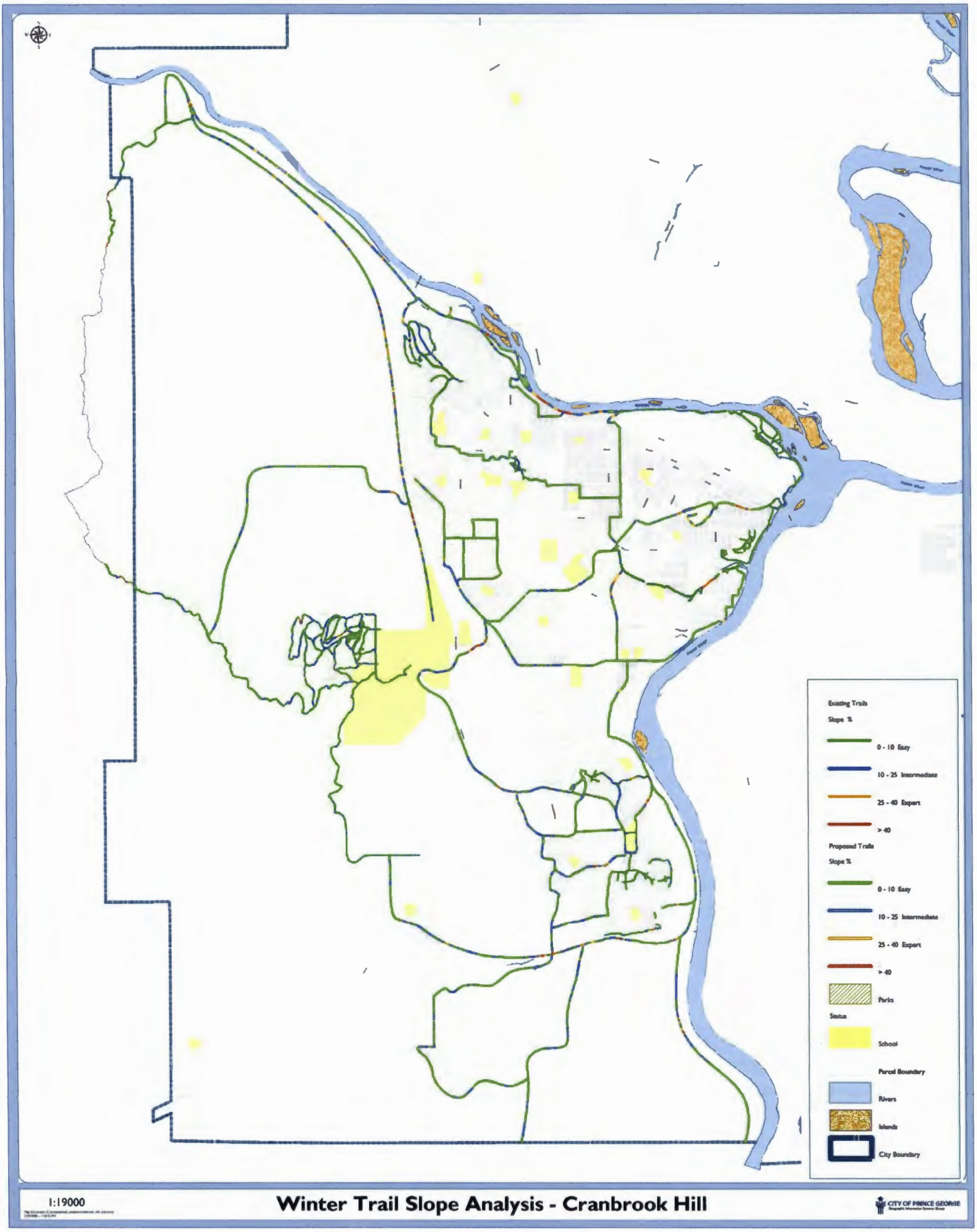


Figure 26 - City & Local Trails <25% Slope (Cranbrook Hill, Downtown, College Heights)

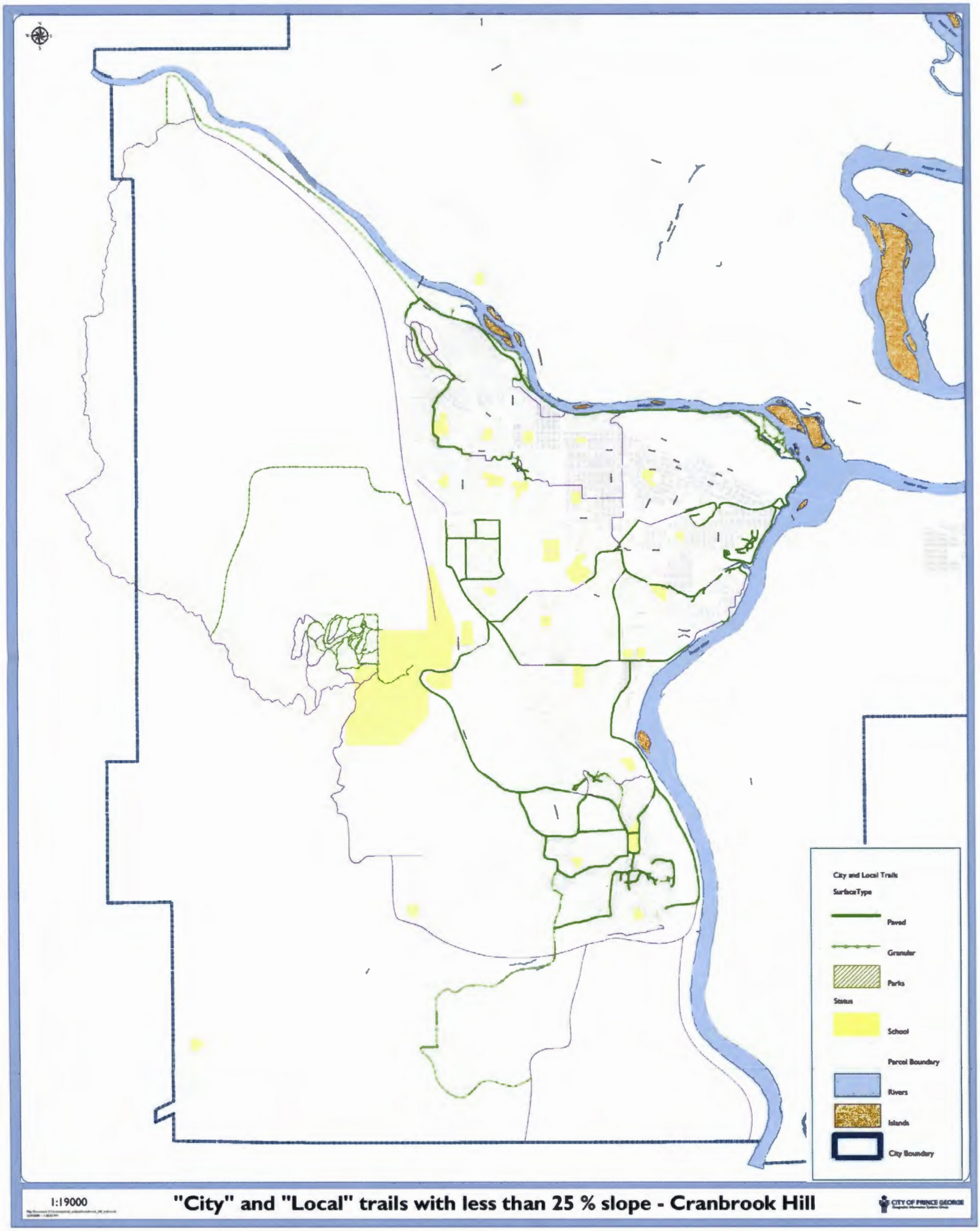


Figure 27 – Winter Trail Slope Analysis (Blackburn)

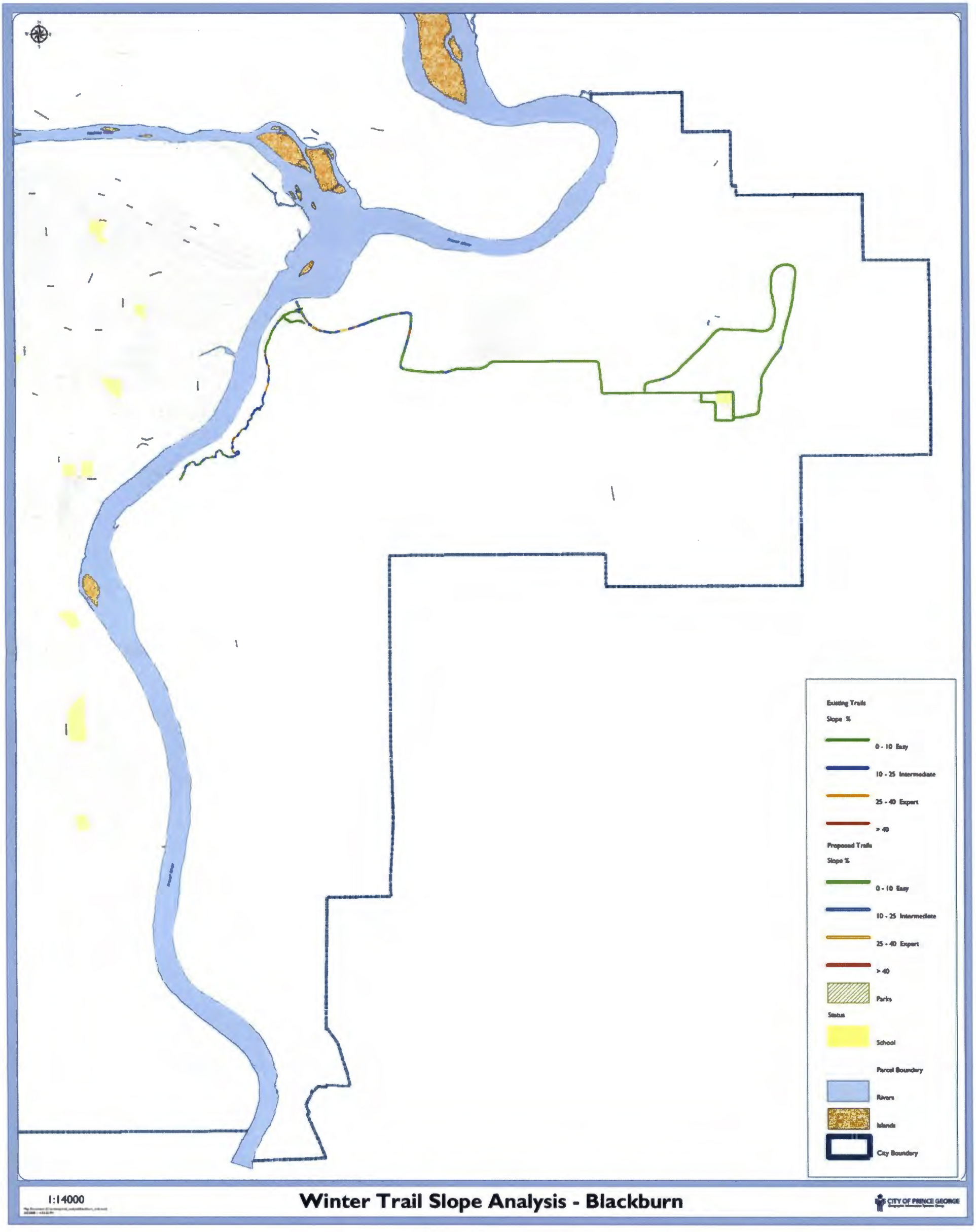


Figure 28 - City & Local Trails <25% Slope (Blackburn)

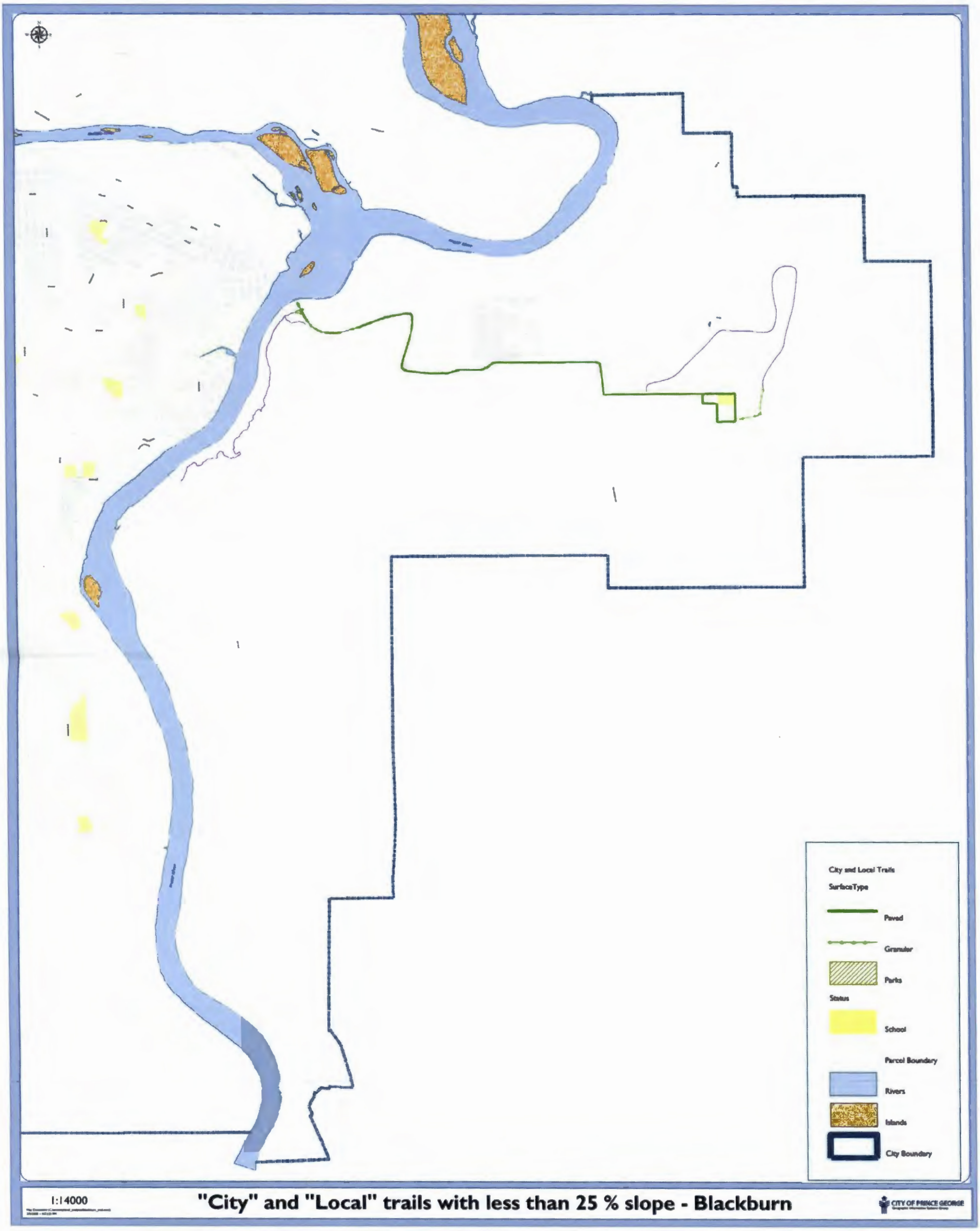


Figure 29 – Winter Trail Slope Analysis (Hart)

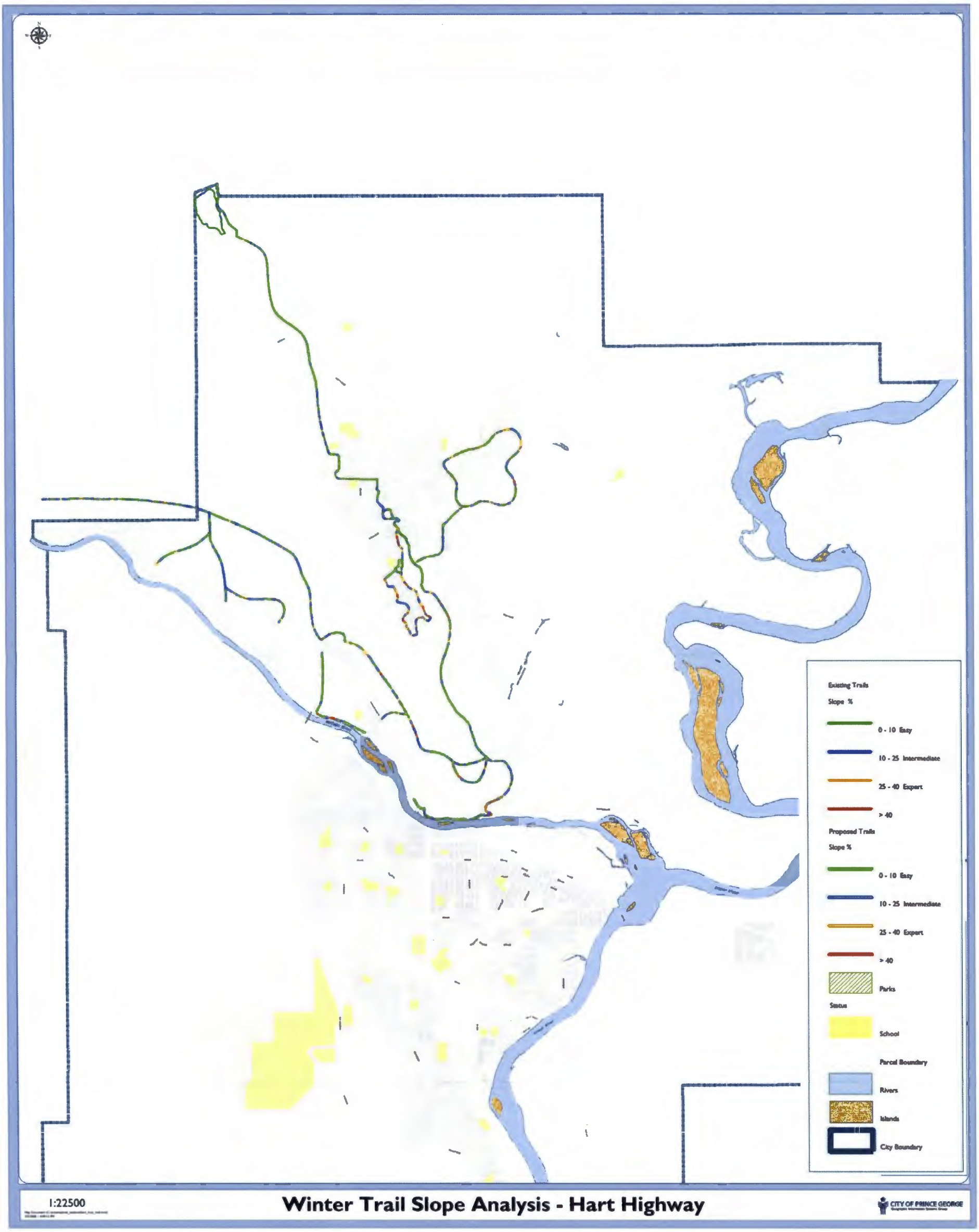
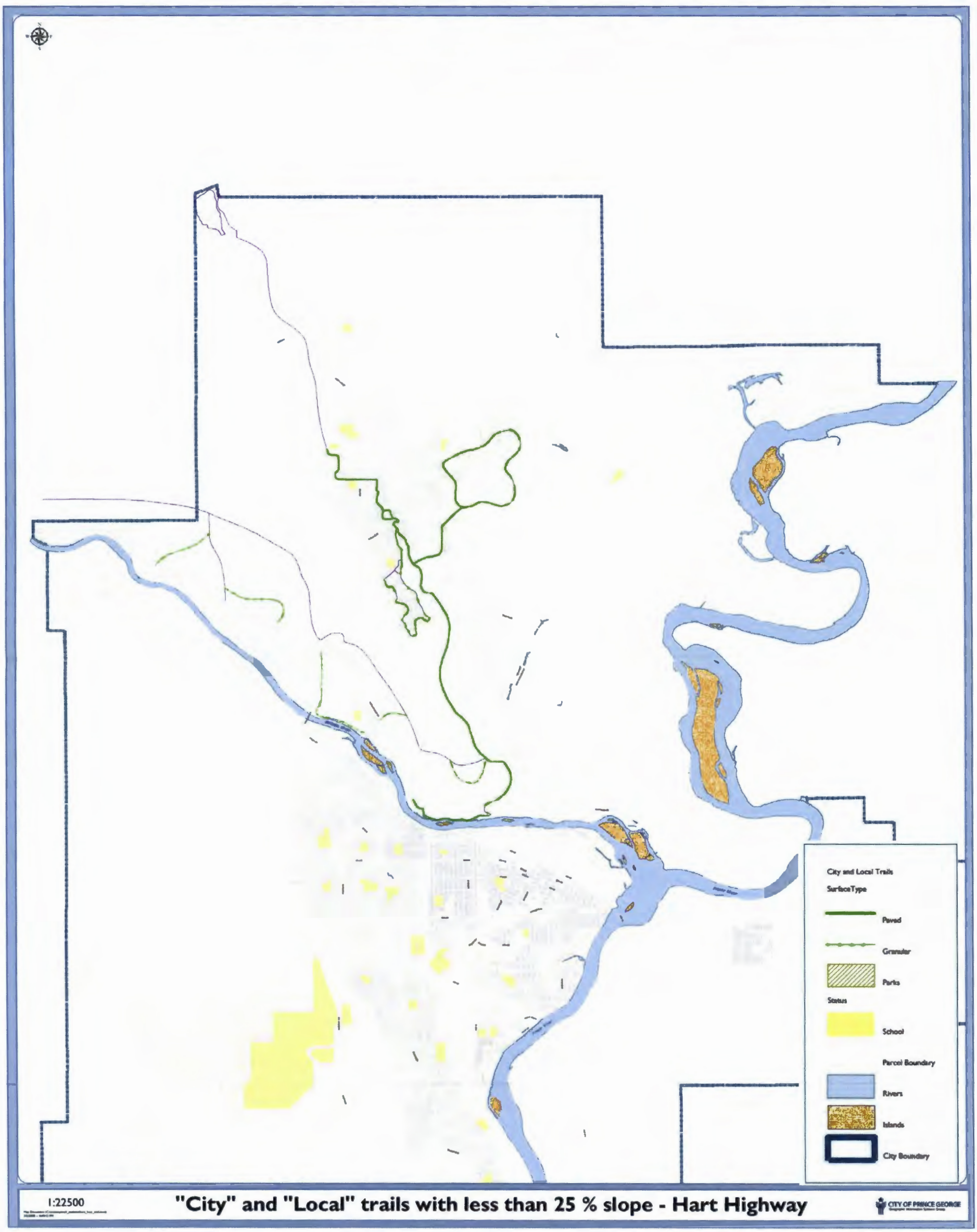


Figure 30 - City & Local Trails <25% Slope (Hart)



6.2 *Winter Trail Suitability Map*

Although the capability maps show where winter trails could be developed based upon physical and design constraints, a winter trail suitability map helps to determine where trails are appropriately developed because of other spatial and environmental limiting factors. A determination of trail location suitability for the City of Prince George came from the following criteria derived from the research:

- environmental considerations
    - 30m buffer from top of bank of fish bearing streams
    - 15m buffer from top of bank of non-fish bearing streams
    - 30m buffer OCP identified wetlands
    - Buffer OCP identified ungulate winter ranges
    - Buffer OCP identified bear habitat
    - Buffer OCP identified waterfowl habitat
- 200 year flood plain buffer
- 400m proximity to parks, schools and residential areas (i.e. 5 minute walk)
- Non-south facing slopes for better snow retention on trails

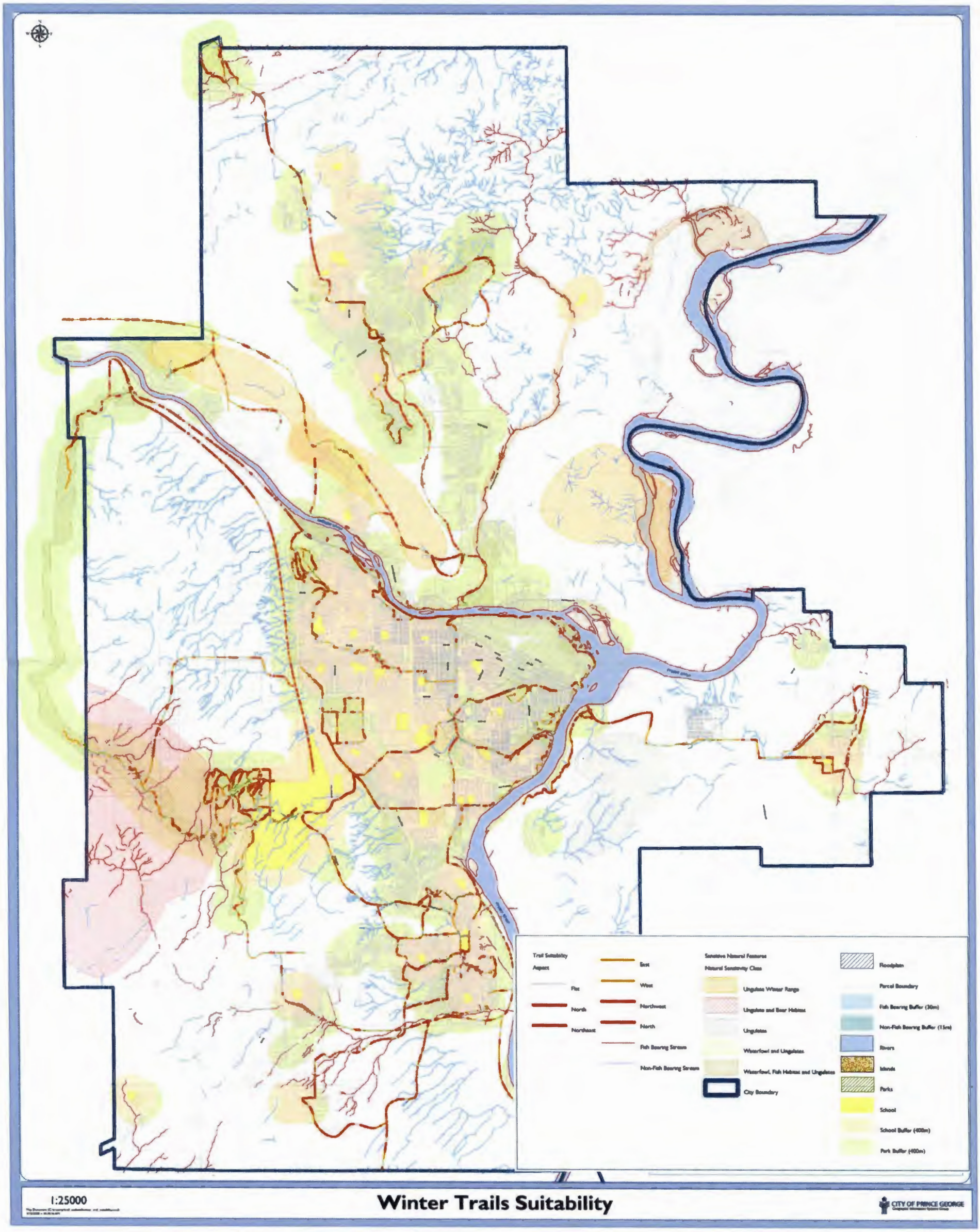
The results of the suitability map illustrated how some districts of the City had existing or proposed trails that were extremely suitable for winter trail development. For example, in the Blackburn area, the Blackburn Loop consisted almost entirely of north facing aspects, had limited environmental constraints and was mostly located within a five minute walking distance to neighbourhood residents, their school and parks.

In fact the desire for north aspects as trail locational criterion did not appear to appreciably impact the possible future provision of winter trails in the community as most existing and proposed trails were north, west or east facing. Some south facing segments were shown that could impact critical trail loops such as the Ridgeview Trail in the Hart. Ground truthing of such segments should be undertaken to determine other site specific aspects that are not accounted for in this analysis such as amounts and types of vegetation that may shadow the trail, hence still allowing for good snow retention similar to that of north facing slopes.

Other areas are not suitable because of environmental reasons, such as indicated for the Nechako Crest Trail on the north side of the Nechako River. As this trail alignment is also not appropriate for winter trail development due to several south facing slopes and is located within ungulate winter range, habitat opportunities for realignment of this trail should be examined. For similar reasons only a portion of the Forests for the World Park and Cranbrook Hill Greenway should be considered for development and maintained for winter trail use.

The suitability map brings together the information from the research and shows the multitude of winter trail opportunities that can exist in Prince George. In future iterations of the City's Trail System Master Plan, such a suitability analysis should be undertaken and expanded to include the latest environmental information so as to be as accurate as possible in the placement of all trails and allow for the possibility of winter trail use as well.

Figure 31 – City Wide Winter Trail Suitability Map



7.0 Conclusion

Winter trails are a desired recreational and transportation feature by residents in winter cities but most municipalities researched do not plan for such trails or accompanying winter uses. The provincial and federal publications are excellent examples in best practices for winter trail planning, development and use and as such should be referred to for guidance in these areas. Some municipalities have recently begun promoting the need to plan and develop winter trails within their community's land use planning policy documents, i.e. Trail Master Plans, such as the trail plans for Whitehorse, Winnipeg, Strathcona County, and Lebanon Hills.

Since most municipalities already have well established and detailed trail standards for the multiple-use of their trail systems, it is necessary to integrate to the greatest extent possible the winter activity trail standard criteria with that of seasonal multiple-use trail standards. As noted in this research, winter trail standards can easily be integrated with that of the 'typical' seasonal multiple-use asphalt and gravel trail standards. The existing clearance zones for these trails, which are devoid of obstacles in the spring, summer and fall, permit the grooming of snow across the entire clearance zone in winter hence making a snow-based trail tread approximately twice as large as the asphalt or gravel trail tread located underneath. This winter clearance zone for maintained bi-directional recreational uses should be at least 4m in width. With wider clearance zones, such as 5m, it may be possible to not only accommodate recreational skiing but also dogsledding, skijoring and even ski races if desired; therefore as gravel trails retain snow better, but the clearance zone width of a multiple-use asphalt standard is preferred (5m), it is recommended that a 3m gravel trail

standard be adopted with a 5m clearance zone for use in areas where asphalt is not necessary and a winter trail is desired.

The location of winter trails is very important for the retention of snow as well as their ability to accommodate a multitude of users. Some winter trails should be considered for snow packing if the trail does not form part of a main commuting or barrier-free route for those with accessibility problems. A regularly maintained snow packing of trails allows for safe movement of people undertaking winter recreational pursuits such as skiing while still permitting pedestrians to use the trails. Since trails that are able to effectively accommodate winter uses are 'city' and 'local' trails, which are used extensively by pedestrians and recreationalists not on skis, the track setting of trails for classic skiing use is not recommended.

The GIS analysis of the City of Prince George City Wide Trail System Master Plan illustrated how these standards can be utilized in the planning of trails at the municipal level. Although many seasonal trails are capable of winter trail use not all trails are suitable for maintenance or use in the winter at the municipal level, e.g. snowmobiling, equestrian, snowshoeing. Environmental information is key to the suitability of the development of trails, and it is this type of analysis which will help guide more detailed planning towards the development of a system of winter trails at the municipal level.

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Appendix A – Research Ethics Board Approval Form

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

RESEARCH ETHICS BOARD

APPLICANTS ARE REMINDED THAT RESEARCH WITH HUMAN SUBJECTS SHOULD NOT BE UNDERTAKEN PRIOR TO APPROVAL BY THE RESEARCH ETHICS BOARD.

APPROVAL FORM

Please check [X] one of the following options before completing the rest of the application.

[ ] This is the protocol statement of a routine undergraduate class project that is usually employed in your class. Please submit 8 copies to the Office of Research for full review by the Research Ethics Board (REB).

[X] This is a research project and a full Research Ethics Board review is requested. Please submit 8 copies to the Office of Research.

1. **Researchers Name** Gerald Christie
2. **Address** 31375 West Lake Road
3. **Phone No.** (250)640-6874 **Email** musher@telus.net
4. **Supervisor's Name & Signature (if Researcher is a student)**

Name & Position (Print) Orland Wilkerson

Signature

5. **Program**

Masters Natural Resources and Environmental Studies

6. **Title of Project**

City of Prince George Winter Trails Master Plan

7. **Type of Project**

[ ] Class Project (Class projects are normally reviewed by professors after a protocol has been reviewed by the Research Ethics Board).

[X] Thesis **(*Project-based Masters)**

[ ] Faculty Research

8. **Source of Funding (if any)**

None

9. **Is this project a replication of an earlier project or protocol that received ethics approval?**

[ ] **Yes** (Attach copy of the Certificate or letter and submit to the REB. Please clarify (on a separate sheet) if there are any changes being made to the previously approved proposal or if the proposals are identical).

[X] **No** (Go to Question 10)

10. Purpose of Research

To aid in the identification of trail user preferences that can be used towards the development of a winter trail master plan.

11. Project Dates:

Expected Start Date	January 14, 2007
Expected Completion Date	January 18, 2008

12. Does this project require any physically invasive procedures (e.g. blood tests), potentially harmful physical regimes (e.g. special dieting) or potentially harmful psychological or social experiments (e.g. illusory perception tests)?

[ ] **Yes**

[X] **No**

13. Summary of Methods: In the text box below give us a brief summary. Sufficient information must be given to assess the degree of risk to participants.

Focus Group - one focus group to be conducted with the City of Prince George Trails Task Force. Focus group will be encouraged to discuss trail issues, types, maintenance and linkages in an attempt to discern appropriate land use planning criteria for winter trail management and development in Prince George. The focus group participants have known each other for some time and have had many informal conversations and formal meetings on similar trail-related topics and therefore the focus group will be encouraged to be conversational similar to what has been done in previous meetings of these members. **For the above reasons the level of risk to the participants of the focus group is assumed to be very low.**

Also, as I know from previous contact with these individuals, the focus group participants consider themselves to be trails enthusiasts, due mainly to their known hands-on knowledge, education and involvement in trail-related groups. For this reason the level of knowledge of the topic area is known to be very high and thus these individuals would be well informed as to the potential benefits that can be derived from this research and that their risk in participating is very low.

14. Please append a complete copy of the research project proposal, including any interview protocols or questionnaires.

Attachments:

[X] Research Project Proposal
[X] Interview Protocols
[ ] Questionnaires

15. How will participants be recruited? In the text box below give us a brief summary.

Focus group participants will be asked for participation through private contact. Members of the Trails Task Force were selected by City Council because of their trail organization, passion regarding trail use and development in the community and are considered 'trails enthusiasts' by the Terms of Reference for the committee. Each individual's application to the Trails Task Force indicates their trail expertise and interest. As this information is public knowledge, and I have come to know some of these individuals on a more personal level as the City Staff Liaison to the Trails Task Force, their selection to the focus group will be based on their fit with the research topic area determined by their application, known type of trail use, and interest in the research topic.

16. Will participants be competent to give consent?

[X] **Yes** (Go to Question 17)

[ ] **No** (e.g. Children and cognitively impaired people.) How will the issue of consent be addressed? In the text box below give us a brief summary.

17. Will participants be compensated?

[ ] **Yes** How?

[X] **No** (Go to Question 18)
In the text box below give us a brief summary.

18. Will consent be obtained from each participant either in writing or recorded?

[ ] **Yes** Please attach a copy of the Consent Form or the questions/statements to be recorded. Each participant must receive one copy of the signed consent form at the time of signing.

[X] **No** Please attach information which will be provided to participants and/or participant communities.

Note: Checklist of items to be addressed in your Information Sheet or Consent Form is provided at the end of this Approval Form.

19. Does the project involve any deception?

[ ] **Yes** Justify the use of deception and indicate how disclosure finally will be addressed.

[X] **No** (Go to Question 20)

20. What is your plan for feedback to participants? How do you propose to distribute results to participants?

A draft of the Winter Trails Master Plan will be provided to focus group participants for comment prior to editing of final plan. The final plan will then be presented to City Council and provided to the public via the city's website.

21. Will the research participants be from an institutional population; e.g. company, agency, schools, colleges, universities, hospitals, prisons, etc.

[ ] **Yes** (Go to Question 22)

[X] **No** (Go to Question 23)

22. If the answer to Question 21 is yes, attach a letter of consent for access from the institution: e.g. company, agency, schools, colleges, universities, hospitals, prisons etc.

[ ] Letter(s) of Consent attached

23. Will the research participants be participating as representatives of, or on behalf of, an Aboriginal group?

[ ] Yes Attach letter of consent from appropriate authority, e.g. Band Council, etc.

[X] No Go to Question 24)

24. Does this project require any other ethical approval, e.g. Hospital, First Nations Band, Health Board, etc.? If so, please ensure that all guidelines are followed.

[ ] **Yes** Please specify the agency ___and attach letter of consent/ethical approval from the appropriate authority.

[ ] Letter(s) of Consent attached

[X] **No**

Appendix B – Focus Group Confidentiality Agreement & Protocols

CITY OF PRINCE GEORGE
WINTER TRAILS MASTER PLAN

TRAILS TASK FORCE FOCUS GROUP
"RESEARCH INFORMATION SHEET"

Researcher: Gerald Christie
Masters Candidate, Natural Resources and Environmental Studies
University of Northern British Columbia
(H) 250-960-9521 (email) gerac000@unbc.ca

Supervisor: Dr. Orland Wilkerson
(W) 250-787-6243 (email) wilkerso@unbc.ca

What is this research?

Winter Trails allow residents and visitors to commute and recreate along pathways of snow. Currently the City of Prince George does not maintain the community trail system during the winter months. With over 70 kilometres of trails maintained during the other seasons of the year this research is looking for input from trail groups and enthusiasts like yourselves about your existing use of the city's trails in winter, desired use of those trails and preferences in regards to winter trail planning, design, and management. This information will then be used towards developing a Winter Trails Master Plan for the City of Prince George.

The focus group format allows for a conversation to take place between all participants on the research topic, i.e. trail planning, and is facilitated where necessary by the moderator or researcher. The information gleaned from this focus group will then be used to help develop a Winter Trails Master Plan for the City of Prince George. No individual participants will be identified within that plan although a general description of some of the comments obtained from the focus group may be used.

The focus group conversation will be audio taped and then transcribed and some written notes may be taken. Once the research has concluded, and the plan drafted, all of the transcription, notes and audio tapes will be securely stored by me and for my use only but will shredded by a commercial shredding service no later than the end of December 2008.

Confidentiality!

- ALL INFORMATION PROVIDED DURING THIS FOCUS GROUP SESSION WILL BE USED FOR STATISTICAL AND DESCRIPTIVE PURPOSES ONLY.
    - Your participation in this focus group is voluntary

- There will be no identification of anyone in the final results to guarantee the anonymity of all participants
- All notes and tapes will be under the control of this researcher only to ensure the confidentiality of all participants and the information that is provided

- Please feel free to ask any questions that you may have regarding the focus group, the research, or the confidentiality of this information at any time.
- The results of this research will be provided in report form to each participant prior to defence of the project or by the end of December 2008, whichever occurs first.
- Any complaints about this focus group can be directed to the Office of Research at the University of Northern British Columbia, 250-960-5820 or reb@unbc.ca

Focus Group Protocols

The focus group session will have the following stages:

1. **Introduction of researcher, research topic and the researcher's role as the facilitator**
2. **Round table introduction of all focus group participants**
3. **Review of Research Information Sheet**
4. **Focus Group Discussion**
5. **Questions**
6. **Concluding Remarks**

Within each stage of the process each participant and the researcher must adhere to the following protocols:

- **All individuals who wish to speak must be given the opportunity to speak**
- **Only one person may speak at a time**
- **The conversation must remain respectful of other people's opinions although discussion on different points of view will be encouraged**
- **One person will not be allowed to dominate the conversation at the expense of excluding others**
- **Foul language or insults will not be tolerated**
- **Participants will need to adhere to the time limits on discussion points as determined by the researcher**
- **Any individual who wishes to withdraw from the focus group can do so at any time**

Thank you for your time!

Appendix C – Trails Task Force Terms of Reference

TRAILS TASK FORCE

Terms of Reference

Task Force Goal

The Trails Task Force will be comprised of trails enthusiasts who have a balanced mix of backgrounds, interests & perspectives and will consult Prince George residents, mobilize support, educate, focus actions and make recommendations aimed at improving the Prince George Trail System. The task force is expected to complete its work within two years of its establishment.

Task Force Mandate

To formulate a five year "Trails Implementation Strategy" which will:

1. Engage residents and provide opportunity for their comment during all aspects of the development of the Trails Implementation Strategy;
2. Identify new trail development projects for Council to consider on a priority basis;
3. Identify deficiencies in the existing trail network, and recommend actions to correct them;
4. Identify barriers that exist which diminish our ability to achieve the results that are intended to flow from points 2 & 3 above;
5. Recommend a financial strategy to Council which:
    - Provides for a five year trails capital investment plan, annual Trail Maintenance budget, and possible annual Trail Upgrades budget;
    - Provides methods to leverage this investment to the greatest degree possible through partnerships and programs.

*Note: The general guide to be used in formulating a strategy shall be the City of Prince George's *City Wide Trail System Master Plan (1998)* and *Official Community Plan (2001)*

Task Force Membership

The voting membership will be comprised of fourteen (14) highly committed & well-informed citizens with varied trail interests and expertise. The membership will be approved by Council as per the normal Council committee appointment process but the following groups should be represented on the task force:

- Cranbrook Hill Greenway Society (1)
- PG Bike Club (1)
- Caledonia Ramblers Hiking Club (1)
- Special Needs Advisory Committee (1)
- Caledonia Nordic Ski Club (1)
- PG Naturalists Club (1)
- Prince George Snowmobile Club (1)
- Nechako Ridge Trails Society (1)
- Regional District of Fraser-Fort George (1)
- PG Horse Society (1)
- Trails Enthusiasts – Community at Large (4)
- City Staff Liaison (non-voting)
    - (e.g. Long Range/Parks Planner) (1)

Structure

- Engage in spirited, analytical & constructive discussions in an open format
- Group will discuss, debate, & prioritize recommendations, predominantly defined from pre-determined issues generated by City Staff
- All recommendations made to Council will be based on majority vote of the members of the task force present
- Presentations may be made by trail construction experts & user groups
- Public & media would be welcome to attend
- Meetings maximum 2 hour length, with start and end times enforced
- Meetings to be managed by a facilitator/chairperson

Pre-Identified Issues or Items for Discussion

Trail Implementation:

- Funding sources
- Partnerships
- Sponsorships
- Land acquisition/agreements
- Liability
- Coordination with Infrastructure Division projects

- Policies & regulations

Trail Construction & Upgrades:

- Priority trails for upgrades
  - E.g. Realignment/upgrade of eroded sections of Heritage River Trail at Cottonwood Island Park
- Priority trails for new construction
- Proposed Trail Standards (Hierarchy)
- Support facilities
- Environmental concerns
- Trails within aquatic areas

Trail Use:

- Development of a Trail Use Code of Conduct
- Current & future trends in trail use
- Bylaw enforcement
- User conflicts
- Safety
- Motorized trail use
- Winter trail use
- Cultural & historical interpretation
- Quality of life

Trail Maintenance:

- Trail surfacing
- Drainage
- Vegetation clearing
- Hazardous trees
- Poop control
- Facilities – signage, bollards, barriers, etc.
- Service levels
- Inspections
- Reporting mechanisms
- Winter Trail Maintenance

Trail Alternatives:

- Cycle Network Plan
- Walkways
- Sidewalks

Trail Systems:

- Existing trail systems
- Proposed trail systems (City Wide Trail System Master Plan)

- Informal trail systems
- Neighbourhood or micro-level trails
- Examples in other communities

Trail Marketing:

- Brochures
- Signage
- Website/Newspaper
- Tourism

Public Involvement:

- Validation of previous public surveys
- Methodologies to obtain public input
- Volunteer or stewardship opportunities

Appendix D – Trails Task Force City Trails Questionnaire

CITY OF
PRINCE GEORGE

City Trails Questionnaire

The Trails Task Force, a volunteer committee appointed by City Council, has been charged with developing a Trails Implementation Strategy for the City. You can help us by completing this short three part survey, which will improve our understanding of people's views about the current and proposed new trails for the City of Prince George. This is an anonymous questionnaire. Results will be tabulated and used for planning purposes only. Thank you for your participation!

PART A: GENERAL INFORMATION

1. Age: < 18 [ ] 18-24yrs [ ] 25-39 yrs [ ] 40-59 yrs [ ] > 60 [ ]
2. Sex:Female [ ] Male [ ]
3. What neighbourhood do you live in? _____
4. Do you use the City's trails mostly for... Recreation [ ] Commuting [ ] Both [ ]

PART B: TRAIL PLANNING & PURPOSE

1. On a percentage basis, during what seasons do you use the trail system?
   (e.g. spring 20%, summer 50%, fall 15% winter 15%)

Spring _____%	Summer _____%	Fall _____%	Winter _____%
(April-May)	(June-August)	(Sept-Nov)	(Dec-March)

2. How often do you use any of the trails in Prince George **during Spring, Summer and Fall**? *(Please circle one letter corresponding to your most appropriate answer.)*
   a. Almost daily
   b. More than once per week
   c. About once per week
   d. About once per month
   e. Only a few times
   f. Never

3. If you <u>never</u> use any of the trails in Prince George **during Spring, Summer and Fall**, please tell us the main reason why? (Please skip to Question 6 if you never use trails in spring, summer, or fall)

_____

_____

4. There are many trails located within the City of Prince George. Three types of trails are maintained by City of Prince George staff but there are also several kilometers of informal and wilderness trails (i.e. non-maintained trails). What type of trail do you use most often?

3m paved [ ] (City Trail) 2m granular [ ] (Local Trail) 1m earth packed [ ] (Rustic trail) < 1m informal [ ] (Not maintained/Wilderness)

5. Which of the following activities do you engage in **most often** on the trails **during Spring, Summer and Fall**? (***Circle one***)
   a. walking/hiking
   b. cycling
   c. jogging/running
   d. skating (in-line, skate boarding, roller skiing)
   e. other (please specify_____)

6. All things considered, please rate your level of satisfaction during the **Spring, Summer and Fall** with the following aspects of the trail type that you use most often? *(Circle one number for each aspect)*

	Very Dissatisfied	**Dissatisfied**	**Mixed**	**Satisfied**	**Very Satisfied**
a. trail surface	1	2	3	4	5
b. trail width	1	2	3	4	5
c. congestion	1	2	3	4	5
d. signage/mapping	1	2	3	4	5
e. washrooms	1	2	3	4	5
f. maintenance	1	2	3	4	5
g. parking	1	2	3	4	5
h. other (specify) _____	1	2	3	4	5

7. How often do you use any of the trails in Prince George **in the winter**? *(Please circle **one** letter corresponding to most appropriate answer.)*
   a. Never
   b. About once per month
   c. About once per week
   d. More than once per week
   e. Almost daily

8. If you **never** use any of the trails in Prince George **in the winter**, please tell us the main reason why.

_____

_____

9. Which of the following activities **do you** engage in **most often** on the trails **in winter**? (*Circle one*)
   a. walking/hiking
   b. cycling
   c. jogging/running
   d. snow shoeing

e. cross-country skiing
f. other (please specify) _____

10. Which of the following activities **would you** engage in **most often** if the trails were maintained in the **winter** for that use? (*Circle one*)
    a. walking/hiking
    b. cycling
    c. jogging/running
    d. snow shoeing
    e. cross-country skiing
    f. other (please specify) _____

11. What would be your top priorities for expansion, upgrade or improvement to the City trails system. Please rate the following priorities from 1 (most important) to 7 (least important).
    [ ] Closing of loops - New trails to link existing trails together
    [ ] Trails that serve the most people possible
    [ ] Provide standards that allow for a greater variety of uses
    [ ] Links that connect with major points of interest (e.g. UNBC, downtown, the rivers)
    [ ] Increased opportunities for commuting (to get to and from work, school etc.)
    [ ] New trails within my neighbourhood
    [ ] Improved existing trails (i.e. wider trails, more hard surface, etc).
    [ ] Other priorities:

_____

_____

12. If you could change anything to improve the trail that you use most often, what would you change?

_____

_____

13. What type of uses do you think are reasonable to consider for the following types of trails? (check)

	Type of Use					
Trail Type	Walking & Jogging	Wheelchair Accessible	Cycling	Mountain Biking	Equine (Horse)	Motorized (ATV/Snowmobile)
City Trail (3m paved)						
Local Trail (2m gravel)						
Rustic Trail (1 m dirt)						
Informal Trail (unmaintained)						
Regional Connection						

PART C: FUNDING

There are a number of options for funding improvements and additions to the trail system. These include funding by other levels of government, grants and sponsorships (from organizations, corporations, individuals) and re-allocation of funds from other city programs. All of these sources would be considered however a further option would be a modest increase in property taxes.

1. Are you supportive of additional trail development and maintenance?

   Yes [ ] No [ ]

2. Would you be supportive of additional trail development and maintenance if an increase in property taxes were necessary?

   Yes [ ] No [ ]

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

Please return this survey to the City of Prince George through any of the following ways:

Mail:
City of Prince George
1100 Patricia Boulevard
Prince George, BC V2L 3V9

Fax: (250) 561-7721

Email: trails@city.pg.bc.ca

If you have any questions or wish to discuss trail developments please email the Trails task Force at trails@city.pg.bc.ca or if you wish to speak to the Trails Task Force City Staff Liaison please call Gerald Christie at 561-7619

Appendix E – Questionnaire Results

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
Age (1=<18yrs;2=18-24yrs; 3=25-39yrs; 4=40-59yrs; 5=>60yrs	**Sex** (1=female; 2=male)	**Spring %**	**Summer %**	**Fall %**	**Winter %**	**Winter use** (1=never; 2=>1/week; 3=1/week; 4=1/month; 5=few times; 6=never)	**Never? Why?**	**Exist activity** (1=walking/hiking; 2=cycling; 3=jogging/running; 4=snowshoeing; 5=cross country skiing; 6=other)			**Other' Comment**	**Poss activity** (1=walking/hiking; 2=cycling; 3=jogging/running; 4=snowshoeing; 5=cross country skiing; 6=other)			**Other Comment'**
4	2	25	50	25	0	6	Climate / Lack of maintenance	1				1			
4	1	20	20	20	20	4		6				6			
4	2	25	25	25	25	1		6				6			
4	2	0	50	0	0	1	No trails right within City	1				1			
2	1	20	20	60	0	6									
3	1	25	40	25	10	4		1				5			
5	2	20	60	20	0	5		1	4	5		1	4	5	
5	2	25	25	25	25	1		4	5						
4	1	25	25	25	25	3		1	4	5		1	4		
4	1	25	50	25	0	3		1				1			
4		20	30	30	20	2		1			Off road motor sports	1	4		
5	2	30	10	30	30	1		1	5			1			
4	1	15	30	40	10	4		1				1			
4	2	25	25	25	25	1		1				5			
4	2	25	25	25	25	3		6				6			off road motor sports
4	2	20	30	30	20	3		2	4	5		2			
5	2	20	50	50	0	3		1				1			
4	2	5	40	40	5			5				1			
4	2	20	50	20	10	1		1				5			
5	1	25	50	25	0	6	We have ski trials at Otway- excellent trails	4	5						
5	2	25	25	25	25	3		6							
4	1	0	0	0	0	4		1				1	4		
4	1	20	40	20	20	1		1				1			
4	1	25	25	25	25	4		6							

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions															
1	2	1				7	8	9				10					
4	1	25	25	25	25	4		1	5			1					
5	1	30	30	30	10			1				1					
3	1	20	50	20	10	1		1				2					
1	1	20	10	20	5	2											
5	2	30	35	30	5	4		5				5					
4	2	20	30	30	20	3		5				1	5				
4	1	33	33	33	0	4	Would rather ski elsewhere and too treacherous for walking	1				3					
4	1	50	50	0	0	6	Difficult to ride horses in ice & snow outside	6			indoor gym						
4	2	25	25	25	25	1		1				1	5			Would use x country ski if available	
3	2	20	20	28	32	1		3				3					
3	2	0	0	0	0		Not cleared										
3	1	25	30	25	20	3		1	5			5					
4	1	50	25	25	0	6	Moved to PG in March 07					1					
4	2	40	20	40	0	6	Doing other things					3					
3	2	25	50	25		6	I am too busy in winter				Not cleared	1	2	5			
5	2	20	20	20	15	2		1				1					
3	1	20	50	20	10	1	I am too busy in winter- year end	1				1					
4	2	25	25	25	25	1		1				1					
4	1	0	0	0	0	2		5				5					
2	1					6	Its cold outside and my skis are bad					1	4				

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
1	2	1				7	8	9				10				
4	2	10	30	20	50	2		4				4	5			
4	1	40	5	15	40	2		1				1	5			
3	1	10	65		25	3		1								
		20	50	15	15	4		1	5			1				
3	2	20	40	20	20	3		1				1				
3	1	40	15	40	5	5	I almost never use the city trails into eh winter because they are not ploughed and are often treacherous with ice and snow packed down- footing is uneven and dangerous	1				6				
4	1	35	35	20	10	3	They are not maintained in the winter	1				1				
4	2	10	55	30	5	3		1				1				
3	1	20	40	20	20	3		1				1				
4	2	10	25	10	5	4		1				1				
5	1	25	25	25	25	1		1				1				
5	2	25	25	25	25	1		1				1				
5	1	25	25	25	25	1		1				1				
4	1	20	10	40	50	1		1				1				
1	2	10	40	10	40	1		6				1				
4	2	0	50	0	0	1	No trails right in the City	1				1				
4	2	0	50	0	0	1	No trails right in the City	1				1				
4	2	25	25	25	25	1		6				6				
4	1	20	20	20	40	4		6				6				

Question	Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
	1	2	1				7	8	9				10				
	4	2	25	50	25	0	6	Lack of Maintenance	1				1				
	5	1	30	30	30	10	1		1				1				
	3	1	0	50	25	25	3		1	4			1	3			
	4	1	0	25	25	50	4		5				5				
	4	2	30	30	30	10	3	Some paved trails need to plowed so I am able to run. I often run between cottonwood and Fort George trails during lunch hour from workplace. If paved trails are not plowed, it forced me to run on the traffic roads	3				3				
	4	1	30	30	20	0	3		1				1				
	3	1	20	40	30	10	3		1				1				
	3	1	20	20	20	20											
	3	2	15	15	60	10	3		1				1				
	4	1	20	50	25	0	6	Weather	4				4				
	5	2	0	100	0	0	6	Snow & cold & wet									
	4	1	30	50	10	10	4		1				1				
	5	2	10	75	0	0	4	Unmaintained	1				1				
	5	1	25	25	25	25	1		1				1				
	4	1	50	50	0	0	6		1				1				
	4	1	0	50	50	0	6	too much snow					1				
	5	2	25	25	25	25	1		1	4			4				
	4	2	25	50	20	5	4										

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
3	1	25	75	0	0	6	Too slippery, cold, parking lot not easy to access	1				1	5		
4	2	25	25	25	25	4		1				1			
4	1	0	40	60	0	4		1	4			4	5		
5	1	33	33	33	0	6	Not kept cleared	6			not cleared enough to walk dogs	6			Walking dogs
2	1	25	25	25	25	4		3	4	5		3	4	5	
5	2	33	33	33	0			1	2	5		5			
2	1	15	50	20	15	2		1				1	4	5	
3		25	25	25	25	3		1	5			5			
5		0	0	0	0										
4	1	20	50	20	10	3		1							
3	1	10	30	10	50	4		5				3			
3	2	0	0	0	100										
3	2	10	30	30	30	2		5				5			
3	1	10	30	30	30	4		5				3	5		
4	2	25	25	25	25	3		3				3			
3	1	15	30	25	30	3		1	5			5			
5	1	0	0	0	15	2		5							
4		0	60	10	30	1		5				5			
4		20	40	20	20	4		1	5			1	5		
3	1	25	25	25	25	3		3				3	5		
2	1	20	30	20	30	3		5				5			
4	2	25	25	25	25	1		3	5			3	5		
4	2	50	50	0	0	4		1				5			
4	2	30	10	40	20	4		1				1			
4	2	0	15	15	70	3		5				4	5		
3	2	19	60	19	2	4		1				1			
3	2	25	25	25	25	3		2	6		dog walking	2	5		
3	2	20	50	20	10	4		3	5			3	4	5	
3	2	25	25	25	25	2	I do use them in winter	5				5			
4	2	30	50	20	0	3		5				5			
2	1	0	50	30	20	2									
3	2	25	25	25	25	1		1	5			5			
3	1	20	50	20	10	3						5			
3	1	0	5	0	95										

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
1	2	1				7	8	9				10				
3	2	25	25	0	50											
3	2	25	25	25	25											
3	1	25	25	25	25											
3	2	25	25	25	25											
3	1	25	25	25	25											
3	2	20	20	20	40	1		3	5			5				
4	1	25	15	25	40	2		5				1				
5	2	20	10	20	50	3		5				5				
3	1	20	80	0	0	6	Need more rec eq for winter eg0 snowshoes, ski					4	5			
4	1	0	50	50		6	Too Icy, no sidewalks even.	1				1				
4	1	30	20	40	10	4		1				5				
3	2	22	22	34	22	4		1	4	5		5				
4	2	20	50	25	5	4		5				5				
2	1	20	20	50	10	4		5				5				
2		15	60	15	10	4		1	2			1	2			
2	2	25	0	25	50	2		4	5			3	4	5		
3	1	25	25	25	25	5		1				1				
3	2	50	50	0	0	1	Ice					4				
2	2	20	40	30	10	4		3				3				
2	1	10	25	50	15	2		1				1				
3	2	30	50	15	5	4		5				1				
2	1	0	0	66	33	4		1	2			3	4	5		
2	1	0	50	50	0	1	To cold. I don't have enough willpower to make myself exercise					1	3			
2	1	0	0	100	0	6	I don't x-country ski									
2	2	20	50	30	10	1	I am allergic to cold.	6			Adolescent stuff like sledding	1	4			
2	1	10	0	80	10	3		3				3				

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
2	1	5	15	60	20	2	Icy- have to walk on snow that edges the trail so I don't slip	1				1			
2	2	0	50	50	0	4		6				3			
2	1	15	50	15	20	4		5				5			
3	2	25	25	25	25	1		1	5			1	5		
2	2	33	0	33	33	4		1				5			
3	2	0	50	50	0	1	Snow	1				1	5		
3	1	25	25	25	25	3		1				3			
2	1	25	25	25	25	1		1				3			
2	2	0	0	50	50	4		1				1			
3	1	25	25	25	25	1		1				1			
4	2	25	50	25	0	4		6				3			
3	1	20	50	20	10	4		1	3	5		5			
4	1	20	40	20	20			5				5			
3	1	20	30	20	30	1		3				3			
4	1	20	50	20	20	3		5				3			
3	1	30	30	30	10	3		1				1	5		
3	1	25	50	25	0	6	Too cold to run								
3	1	15	30	15	30	4		5				5			
3	1	10	30	40	20	3		1				1			
3	1	0	100	0	0	6	No Snow Removal					3			
3	1	30	40	20	10	2		1				3			
3	1	25	50	25	0	6	Access					3			
3	1	50	20	15	15	6	I've never had anybody that I knew that used the trails in the winter	5				3	5		
3	1	20	50	20	20	3		5							
3	1	25	60	35	25	3		3				2	3		
3	1	20	60	20	0	6	Snow & Ice	5				3	5		
3	1	25	50	25	0	2		5				3			

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
1	2	1				7	8	9				10				
3	1	0	50	50	0	6	Poor lighting/no lighting on some trails-especially if you can only run in evenings. Otway is lit but so many other trails aren't-but they are probably not City???					3				
3	2	30	65	5	0	5		1				1				
1	1	25	40	20	15	4		3				2				
4	1	25	25	25	25	1		4				5				
4	1	80	100	100	80	1		1	3			1	3			
4	2	20	30	40	10	3		1				1				
4	1	10	50	30	30	3		5				5				
4	1	25	25	25	25	1	Some trails become sheer ice in winter, making them very difficult to walk on.	1				1				
5	1	10	40	40	10	2		1				6				
4	2	0	80	20	0	6	Too busy with other activities	1				6				
3	1	25	50	15	10	3		3				3				
5	2	25	40	25	10	3		3				3	4	5		
4	2	25	25	25	25	1		1				1				
4	1	22	28	28	22	1		3				3				
3	2	25	70	5	0	5	Climate and most trails are not cleared for use.	1				1				
4	1	25	25	25	25	2		1				1	5			
4	2	20	30	20	30	4		5				5				
4	2	25	25	25	25	2		3				3				

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
1	2	1				7	8	9				10				
3		20	30	20	30	4		5				5				
3	1	10	70	20	0	5		1				1				
4	1	10	80	10	0	1	I use the trails for horseback riding, from Exhibition Park to Ginter Park and connecting to Cranbrook Hill. The footing is too icy for horses and not worth the risk of an injury.	1				1				
4	1	25	25	25	25	3	The conditions determine which trails are used, for example I would avoid LC Gunn if we have had freeze thaw conditions and would not even attempt this trail without ice cleats.	1				1				
4	2	25	25	25	25	1		1				1				
5	2	10	45	45	0	5		6				6				
4	2	5	75	5	15	4		3				3				
2	1	10	50	30	10	3		6				3				
4	1	30	25	30	15	2		1				1				
3	1	25	40	25	10	4		1	3			1	3	5		
4	2	0	40	40	20	2		6				1				

Question	Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
	1	2	1				7	8	9				10			
	3	1	10	60	20	10	4		1				1			If trails were maintained enough for our two year old to walk on.
	3	2	0	100	0	0	6	Too cold and not maintained.	1				1	4		
	3	1	25	50	25	0	5	Too much snow usually.	1				1			
	4	2	20	50	20	10	5	I would use them more but once again having to deal with digs and their mess that the owners don't pick up!	1				1			
	4	2	25	45	25	5	5	not maintained / cleared; weather	1				1			
	4	2	30	15	30	25	1		1				1			
	4	2	20	40	20	20	3		1				1			
	1	2	20	50	10	20	4		1				1			
	5	2	25	25	25	25	1		6				1			
	4	2	25	25	25	25	2		1				1			
	4	2	10	10	10	70	3		6				6			

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions									
1	2	1				7	8	9			10
4	1	25	45	25	5	5	Icy conditions is the main reason I won't use some of the trails - I would be taking my life in my hands trying to walk on the trails (e.g. Hudsons Bay Slough connector to the Heritage Trail, Cottonwood Island Park)	1			1
4	1	25	25	25	25	2		1			1
4	1	20	40	30	10	4		1			1
3	2	20	40	20	20	3		1			1
4	1	32	32	32	4	5	Trails are not maintained and are very slippery and treacherous. Would rather go skiing and the city's trails are not suitable for skiing due to too much foot traffic causing them to be rutted, icy and not enjoyable.	1			1

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions														
1	2	1				7	8	9				10				
3	2	20	15	30	35	2		2				6				
3	2	20	50	20	10	4		5				3				
4	1	25	25	25	25	2		1	4	5		5				
4	2	25	65	25	15	2		5				1				
3	1	30	30	30	10	4		1	5			1	4	5		
4	1	5	35	5	10	4		1								
3	1	25	35	30	10	3		1				1				
4	1	10	50	30	10	4	Mainly due to lack of maintenance - snow is too deep.	1				1	5			
4	1	20	50	20	0	1						1	5			
4	1	10	25	25	15	4		5				5				
4	1	20	50	20	10	2		1				1				
4	2	25	25	25	25	1		1				1				
4	1	25	50	25	0	4		6			Skating at Shane Lake	5	6		Skating at Shane Lake	
4	1	20	50	20	10	2		1				5				
5	1	20	50	20	0	6	I prefer to ski at Otway.	5				5				
4	1	33	33	33	1	6	I have a bad knee and cannot risk slipping and falling.					1				
3	1	15	5	2	15			5				3				
4	2	25	25	25	25	6		5				5				
3	2	25	40	20	15	1	Most trails are not plowed in the winter e.g. River Heritage Trails	1				3				
5	2	40	10	40	10	4		1				1	5			
4	2	10	80	10	0	4		5				5				
4	2	10	80	10	0		No time. No need or desire to exercise outdoors.									
4	1	25	25	25	25	3		1	2			1	2			

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
4	1	25	40	25	10	4		5				5			
2	1	30	40	30	0	3						1	5		
3	1	0	50	50	0	6	Never were around but will tour soon.					1	4		
4	2	25	50	25	0	6	Do not like winter								
5		0	0	100	0	6									
3	1	10	50	10	10	3		1				1			
5	2	15	50	20	15	2		4				4			
4	2	33	33	33	0	6	Don't go out.	5				1	2	3	
3	1	40	20	40	0	6	Lung problems - old air makes outdoor walking nearly impossible.								
4	2	0	100	0	0	6	Cold and snow	6			none	6			none
3	2	0	80	20	0	2		1				1	3		
4	1	25	25	25	25	4		1				1	5		
4	1	15	50	25	10	3		1	5			1	5		
3	1	30	50	10	5	6	Too much snow on trail	1				1			
4	2	25	50	25	0	6	Snow/cold					1			
4	1	25	50	20	0	3	Afraid to walk on slippery conditions	1				1			
3	1	30	30	30	10	4		4	5			1	3		
4	1	20	0	15	15	3	not plowed	6			scooter	6			scootering
5	2	20	50	15	15	2	not plowed	6			scooter	6			scootering
3	2	33	33	33	0	6	snow	1				1			
5	1	0	100	0	0	2		1				6			horse riding
3	1	20	50	20	10	4		1	6		sledding (toboggans)				
3	1	25	50	25	0	6	Accessibility	1				1			
4	1	33	33	33	1	6	cold					2			

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
4	1	30	60	0	10	4		1				3			
5	1	15	20	15	0	2	Accessibility	1				1			
4	2					2		1				1			
4	1	25	25	25	25			1				1			
2	2	33	33	33	0	3	Too slippery	1				1			
3	1	15	60	15	5	2		1				1	4	5	
5	1	25	25	25	25	1		1				1			
4	2	35	15	35	15	4		1				1			
4	1	20	30	30	20	4		1				1			
5	5	15	70	15	0	4		1				1			
3	1	40	10	40	10	1		1	5			1	5		
4	2	20	50	15	15	1									
4	1	33	33	34	0	4	Too much snow and ice.	1				3			
4	1	35	30	35	0	6	I thought the trails would not be open.					5			
4	2	10	30	10	50	1									
3	2	25	25	25	25	3		1	5			5			
4	1	20	40	20	20	4		1				1			
3	2	30	30	40	20	3		5				1			
4	1	25	25	25	25	3		5				3			
4	1	10	15	10	65	2		1	5			1			
4	1	25	25	25	25	2		1	4	5		5			
4	1	20	50	20	10	4		1				1			
4	2	10	10	0	80	1		5				5			
4	2	25	25	25	25	2		3				3			
3	1	10	40	30	20	4		1	5			5			
5	2	20	60	20	0	4	No snow cleared	3				3			
4	2	0	10	60	40	3		1	3	5		1	3	5	
4	1	20	50	15	15	3		5				1			
4	2	0	50	50	0	6	Very busy and use trails closer to home that are on private property (end of Monteray Road)	1				1			

Question

Part A - General Info		Part B - Trail Planning & Purpose - Winter-Related Questions													
1	2	1				7	8	9				10			
4	2	20	50	20	10	2		1				5			
4	1					6	Not a winter trail runner	5				3	5		
4	1					6	Not safe for running					5			
4	1	25	25	25	25	4		3				3	5		
4	2	0	75	0	25	3		5				5			
4		25	25	25	25	2		3	5			3	5		
2	2	20	20	30	30	3		1				5			
3	2	25	25	25	25	1		1				2			
3	1	25	25	25	25	1		1				2			
4	1	20	30	20	30	4		5				5			
5	2	30	30	30	10	3		5				5			
4	1	30	30	20	20	4		1				5			
4	1	10	50	20	20	1		1	5			5			
4	2	10	50	15	25	4		5				5			
4	2	10	70	10	10	4		1				1	5		
4		33	33	33	0	4		1				1			
2	2	20	0	40	40	4		5				3			
4	1	10	40	10	40	2		5				1			
1	2	15	25	10	50	3		5				5			
1	1	20	10	20	50	2		5				5			
2	1	20	10	20	50	1		5				2	5		
4	2	25	40	25	10	6		3				3			
5	2	15	65	15	5	2	Usually too icy and dangerous.	1				1			

Appendix F – Open House Map Comment Summary

Trails Task Force Public Open House
November 29, 2007

Map Comment Summary

UNBC Connector should be developed

- Washrooms, pavilions, way finders, signage, and lighting are important
- Stairs on trails and circuit training facilities are not supported
- Even split of comments regarding motorized use on specific trails that lead to regional areas (e.g. Blackburn to Tabor Mountain)
    - What about enforcement?
    - Don't think it is appropriate within city limits
    - Yes its okay but only near outskirts of the City
- Otway Road trail link needed
- Off-street trail needed from the Hart to downtown
- Better routing needed from Cranbrook Hill to downtown
- Numerous comments received agreed (100%) that new developments must be required to develop trails that connect to the City's trail system (continuity important)
- Strong support for a trail difficulty rating system
- Strong support for winter trail maintenance
    - Plow major trails, e.g. Heritage River Trail at Fort George Park
    - Pack other trails for skiing and walking
- Support for equestrian use on some trails
- Parkridge Creek Greenway trail should be developed

Appendix G – Focus Group Confidentiality Agreement & Protocols

CITY OF PRINCE GEORGE
WINTER TRAILS MASTER PLAN

TRAILS TASK FORCE FOCUS GROUP
"RESEARCH INFORMATION SHEET"

Researcher: Gerald Christie
Masters Candidate, Natural Resources and Environmental Studies
University of Northern British Columbia
(H) 250-960-9521 (email) musher@telus.net

What is this research?

Winter Trails allow residents and visitors to commute and recreate along pathways of snow. Currently the City of Prince George does not maintain the community trail system during the winter months. With over 70 kilometres of trails maintained during the other seasons of the year this research is looking for input from trail groups and enthusiasts like yourselves about your existing use of the city's trails in winter, desired use of those trails and preferences in regards to winter trail planning, design, and management. This information will then be used towards developing a Winter Trails Master Plan for the City of Prince George.

The focus group format allows for a conversation to take place between all participants on the research topic, i.e. trail planning, and is facilitated where necessary by the moderator or researcher. The information gleaned from this focus group will then be used to help develop a Winter Trails Master Plan for the City of Prince George. No individual participants will be identified within that plan although a general description of some of the comments obtained from the focus group may be used.

The focus group conversation will be audio taped and then transcribed and some written notes may be taken. Once the research has concluded, and the plan drafted, all of the transcription, notes and audio tapes will be destroyed but certainly no later than the end of 2008.

Confidentiality!

- **ALL INFORMATION PROVIDED DURING THIS FOCUS GROUP SESSION WILL BE USED FOR STATISTICAL AND DESCRIPTIVE PURPOSES ONLY.** Your participation in this focus group is voluntary and no identification of yourself is necessary
- Please feel free to ask any questions that you may have regarding the focus group, the research, or the confidentiality of this information at any time. Any complaints about this focus group can be directed to the Office of Research at the University of Northern British Columbia, 250-960-5820.

Focus Group Protocols

The focus group session will have the following stages:

7. **Introduction of researcher, research topic and the researcher's role as the facilitator**
8. **Round table introduction of all focus group participants**
9. **Review of Research Information Sheet**
10. **Focus Group Discussion**
11. **Questions**
12. **Concluding Remarks**

Within each stage of the process each participant and the researcher must adhere to the following protocols:

- **All individuals who wish to speak must be given the opportunity to speak**
- **Only one person may speak at a time**
- **The conversation must remain respectful of other people's opinions although discussion on different points of view will be encouraged**
- **One person will not be allowed to dominate the conversation at the expense of excluding others**
- **Foul language or insults will not be tolerated**
- **Participants will need to adhere to the time limits on discussion points as determined by the researcher**
- **Any individual who wishes to withdraw from the focus group can do so at any time**

Thank you for your time!

Appendix H – Focus Group Session Outline

City of Prince George

Winter Trails Master Plan

FOCUS GROUP SESSION OUTLINE

Winter Trails allow residents and visitors to commute and recreate along pathways of snow. Currently the City of Prince George does not maintain the community trail system during the winter months. With over 70 kilometres of trails maintained during the other seasons of the year this research is looking for input from trail groups and enthusiasts like yourselves about your existing use of the city's trails in winter, desired use of those trails and preferences in regards to winter trail planning, design, and management. This information will then be used towards developing a Winter Trails Master Plan for the City of Prince George.

The focus group session is expected to last no more than 1 ½ hours.

Discussion

A) Winter Trails … what are they to you?

- Leisure opportunity
- Wildlife appreciation
- Commuting
- Physical activity
- Family time
- Community spirit/winter city celebration

B) How do you use Winter Trails? How often?

- Recreational or utilitarian?
- What other kinds of uses do you think are acceptable on Winter Trails?
- What about motorized uses?
- What about horses?
- As a user of Prince George trails in the winter, how often are you on the trails?
- On average, for how long do use trails in the winter during each visit?
- Do your children use trails in the winter?

C) Where should they be located, generally speaking?

- Regional connectivity
- Commuting to downtown, UNBC
- Recreational connectivity to Otway, Greenway
- Park to park, park to school
- Motorized use areas or connectivity to these areas
- Residential loops

D) What should the design of a Winter Trail look like in the community?
- Width of the trail? Right of way?
- Minimum snow depths
- Creation of loops
- Commuting links
- Use of sidewalks
- Use of paved, gravel or natural surfaces for winter trails
- Environmental planning considerations, e.g. wildlife

E) How should Winter Trails be maintained?
- Snow packing
- Snow clearing
- Track setting
- Icy conditions. Gravelling/sanding
- Tourism-related events, e.g. skijoring, dogsledding, running
- Lighting
- Cottonwood Island Park, Forests For The World

F) Are there any safety or other issues that need to be considered in regards to Winter Trails?
- Lighting
- Hazards, i.e. environmental, traffic
- Marketing and mapping of trails
- Community trail difficulty rating system
- Signage
- Multi-use

Appendix I – Trail Design Summary from Major Trail Publications & Sport Governing Bodies

- BC Ministry of Forests
- BC Parks
- Cross Country Canada
- International Sled Dog Racing Association

Seasonal Trail Type	Sub-type	Barrier Free (accessibility)	Surface	Tread Width(m) preferred	Tread Width(m) min	Horizontal Clearance	Vertical Clearance	Curve Radius min (m)	Slope (ave) preferred	Slope (ave) max	Elevation Gain max (m)	Stopping/Sight Distance (dependent upon grade on design speed)	Grade Crossfall	Superelevation	layout design	structures	Maintenance	Notes
Multi-Use																		steps for gradas beyond 10%
barrier-free			hardened; asphalt, crushed stone (sealed)		2		2.5		0-3%	5%						engineered		
on-street																		
off-street																		
	hard																	
	natural																	
	divided																	
Specific Use																		
Hiking																		
	semi-primitive			0.9	0.45				0-10%	15%					linear or loop; spur trails to features			
	roaded resource			0.9	0.45				0-10%	15%					linear with loops; spur trails to features or communities			
	rural			0.9	0.45				0-10%	15%					loops, maze or spoked wheel; allow for variety of terrain			
Equestrian			gravel or crushed stone (preferred)	1.5	1.2	2.5	3	2	0-10%	15%					loop (day use) or linear (distance) design, long turns preferebie instead of tight switchbacks;	bridges need to be non-slip and able to support number of horses that can fit on the length of the bridge	intesive use areas may require more surfacing; trails should be in areas of stable soils, avoid wet areas;	short pitches (30m) of higher slopes permitted (20%); smooth fords are preferred to bridges where water depths <0.6m; consideration needs to be given to permitted grazing and feeding areas
Cycling																		
	mountain biking	semi-primitive	natural	0.3		1	2.5		15%	>30%					loop or linear; curvilinear alignments; run out sections			varied surfaces;
	mountain biking	roaded resource	natural	0.6		1.2	2.5		10%	30%					loop or linear; curvilinear alignments; run out sections	steps considered over 10% slope with		sections of rough surfaces;

													ramps on side for bike wheels;	
mountain biking	rural	natural	>0.6		>1.2	2.5		5%	10%			loop or linear; curvilinear alignments; run out sections	steps considered over 10% slope with ramps on side for bike wheels;	relatively smooth surfaces
Winter Trails														
Skiing		snow; preferebly 60cm deep				2.5 plus expected snow depth						satellite, staked-loop, spoked wheel, and maze; base loop to accommodate novice skiers, outer loops become more difficult	bridges need to support animals and grooming equipment; engineered bridges	horizontal clearence is the tread width in this case; signage as per international standards; minimum 15cm hard blue ice for lake and stream crossings minimum 3m clearance required for grooming equipment minimum 3m clearance required for grooming equipment minimum 3m clearance required for grooming equipment
	novice		5		5				10%	20 (over 3km)				
	intermediate		4	3					25%	35 (over 5km)				
	expert			3					40%	75 (over 15km)				
Snowshoe														N/A
Snowmobile												multi-loop layout; variety in topography; use of existing routes not planned for other uses		consideration in trail design of avalanche potential, lighting, snow depth
	novice		3.6		5	2.5 plus max. snow depth	7.6	8%	25%		15%			
	intermediate					2.5 plus max. snow depth	7.6				30%			
	difficult		3		4.2	2.5 plus max. snow depth	7.6	15%	35%		40%			
Dogsledding & Skijoring														N/A

BC Ministry of Lands and Parks – BC Parks (2005)

Seasonal Trail Type	Sub-type	Barrier Free (accessibility)	Surface	Tread Width(m) preferred	Tread Width(m) min	Horizontal Clearance	Vertical Clearance	Curve Radius min (m)	Slope (ave) preferred	Slope (ave) max	Elevation Gain max (m)	Stopping Sight Distance dependent upon grade on design speed)	Grade Crossfall	Super-elevation	layout design	structures	Maintenance	Notes
Multi-Use																		
barrier-free		yes	hardened		2				0-3%	5%					one hour loop trails	non skid surfacing; bridge boards laid parallel to travel; engineered structures		hard surfacing may include ashpalt, limestone, boradwalk, etc.
on-street																		use cycling trail type
off-street																		use cycling trail type
	hard																	use cycling trail type
	natural																	use cycling trail type
	divided																	use cycling trail type
Specific Use																		
Hiking																		
	Type I	yes	course	2					5%	8%					loops or stacked loops	engineered		may be used as ski trails
	Type II	no	natural or gravel	1.25					5 - 8%	10%					loops or stacked loops			may be used as ski touring trails
	Type III	no	natural	0.75						15%					follow topo and features, loop if possible			may be used as ski touring trails
	Type IV	no	natural	0.5						n/a					follow topo and features, loop if possible	none or very simple		wilderness trail, little management or facilities
	Type V	no	natural	n/a						n/a								wilderness trail, snow passes, no facilities
Equestrian																		
	Type I	no	compacted / crushed stone	1	0.45	2.5	3	2	0 - 10%	15%					tread width wider in hazardous areas (1.2-1.5m)			loop trail
	Type II	no	natural but well drained													little or none - bridges in wetland areas		possible snowmobile route in winter
	Type III	no	natural															wilderness areas
Cycling																		
	Type I	yes	asphalt	2.5	2.5	3	3.5	2.5	2-5%	10%		15.2 - 94.5		2-4%	two-way traffic, loops, spurs, linear trails mostly with some curves. Depending on road cycling design speed curve radius increases dramatacially.	bridges with no skid decking; bridge width min. 3m; stairs where grades >10% with side ramps for bike wheels		may be used as groomed cross country ski trails
	Type II	no	crushed limestone or compacted gravel	2		2		2.5	5%	15%		15.2 - 94.5		4%	two-way traffic			may be used as groomed cross country ski trails
	Type III - mountain bike	no	natural	0.7	0.5	1.5		2	10%	22%					one-way traffic			mountain bike trail, may be used as ski touring trails

	Type IV - mountain bike	no	natural	0.5	0.3	1		1.5	15%	25%			one-way traffic			mountain bike trail
Winter Trails																
Skiing			snow, min. 0.6m deep; min. 15cm hard blue ice required for lake/stream crossings										trails to be located on north facing hillsides for snow retention if possible; vegetation for wind and drifting snow protection on lee side of hills	bridges over small streams not needed in areas where they are frozen for the winter; bridges must support grooming equipment; bridge railings required	may need to provide vertical clearance of 4.5-5m in heavy snowfall areas and where branches droop under weight of snow; more maintenance required on south facing slopes due to crusting, icing and melting;	use topography to help control speed; avoid south facing hillsides; use rating system of 'easiest', 'difficult, and 'most difficult' with directional arrow and distance (text);
	Type I - racing (easiest)		snow	5.5		4	2.5 + snow depth		5%	10%	100	5%	satellite, staked, spoked wheel and maze designs; outer loops most difficult		pack after 15cm has fallen; solid base preferred	Use Cross Country Canada regulations; full size groomer needed
	Type II - Cross Country (more difficult)		snow	4	3	3	2.5 + snow depth		18%	25%	600	5%	need overshoot areas (runouts); short steep climbs okay;		pack after 15cm has fallen; solid base preferred	groomed trails for classic and skate ski; double tracking possible; snowmobile groomed; slopes exceeding 10% need min 3m tread width for herringbone or sidestepping
	Type III - packed (most difficult)		snow	3	1	2.5	2.5 + snow depth			40%	1500	5%	one way loop; need overshoot areas (runouts);		pack after 15cm has fallen;	groomed trails but no track setting; classic skiing; possible to existing summer hiking trails; snowmobile groomed
	Type IV - ski touring		snow													defined routes but no grooming; wilderness setting;
Snowshoe			snow						avoid steep sustained grades				Designs of type I and II hiking trails and Type III packed ski trails can be used for snowshoe trails. Type III backcountry hiking trails could be used as designated snowshoe routes.			These trails should be separated from snowmobile or cross country ski trails due to conflicts.
Snowmobile													environmental design considerations take precedence when locating snowmobile trails.			
	Type I		snow	3.6	3	5	2.5	7.6	8%	25%			easiest; horse trails and beckcountry roads			snowmobile trails not compatible with other winter uses;
	Type II		snow	3.5	3	4.2	2.5	7.6	15%				intermediate to advances; narrow steeper grades; sharper curves			
	Type III		snow	3.5	3	4.2	2.5	7.6		35%			no developad trails; snowfields			
Dogsledding & Skijoring																N/A

Seasonal/ Trail Type	Sub-type	Duration	Tread Width(m) preferred	Tread Width(m) min	Horizontal Clearance	Vertical Clearance	Curve Radius min (m)	Slope (avg) preferred	Slope (avg) max	Elevation Gain max (m)	Height Difference - lowest to highest point (m) - depends on class	Maximum Climb (m) - depends on class	Total Climb (m) - depends on class	Stopping/Sight Distance (dependent upon grade on design speed)	Cross-Crossfall	Superelevation	layout design	structures	Maintenance	Notes
Winter Trails																				
Skiing	race course	snow (30cm min.)	6 (CLASSIC) uphills); 9 (FREE uphills)	3 (CLASSIC); 4 (FREE)				9-18% (short uphills 10m - 29m & >30m only if broken by undulating sections of <200m and/or downhill <10m)	>18% (steep sections 4<10m)		75 - 150	40 - 75	75 - 2000				skier to ski no more than each portion of the course more than twice; no two traffic on same treck; runouts required; two skiers must be able to pass without hinderence; course must provide technical, tactical and physical test of participants; woodland course; undulating		hardened snow base must be maintained'	race course regulations include both classic and skate skiing competitions; 10m width for last 200m of course

Seasonal Trail Type	Sub-type	Surface	Tread Width(m) preferred	Tread Width(m) min	Horizontal Clearance	Vertical Clearance	Curve Radius min (m)	Slope (%) preferred	Slope (%) max	Elevation Gain max (m)	Height Difference - lowest to highest point (m) - depends on class	Maximum Climb (m) - depends on class	Total Climb (m) - depends on class	Stopping Sight Distance (dependent upon grade on design speed)	Grade Crossfall	Superelevation	layout design	structures	Maintenance	Notes
Winter Trails																				
Cross County Skiing	novice	Snow	3m (gredes >10%)	1.5m	1.5m – 3m	2.5m above snow depth			10%								Stacked loop, satellite loop, spoked wheel and maze for day use trails; one way trails should be considered in high use areas; south facing slopes to be avoided; lee side of hills preferred as shelter from wind	Bridges not required over streams that freeze completely; plastic signage indicating novice, intermediate or expert classification by shapes or colours along with trail names is desirad	2.5m width minimum for trails to be groomed;	Runouts required at end of long grades with no bridges at bottom; seasonal multiple-use is desired for these trails, e.g. equestrian, cycling in summer; 15cm min. snow depth, 60cm desired
	intermediate	Snow	3m	1.5m	1.5m – 3m				25%											
	Expert	Snow	3m	1.5m	1.5m – 3m				40%											

Seasonal/ Trail Type	Sub-type	Surface	Trail Width(m) preferred	Trail Width(m) min	Horizontal Clearance	Vertical Clearance	Curve Radius min (m)	Slope (ave) preferred	Slope (ave) max	Elevation Gain max (m)	Height Difference - lowest to highest point (m) - depends on class	Maximum Climb (m) - depends on class	Total Climb (m) - depends on class	Stopping/Sight Distance (dependent upon grade on design speed)	Cross Crossfall	Superelevation	layout/design	structures	Maintenance	Notes
Winter Trails																				
Dogsledding & Skijoring		snow	3	2			30							50km/h max design speed			fields, lakes, logging roads, trails with undulating terrain; lapping back on same trail to be avoided; large loop trails prefarable; no hairpin corners; fencing to delineate trails at appropriate intersections; 10m min. from open roadweys		hardpacked by snowmobile or machine with drag;	safety and fastest speed possible are , main considerations; trail must be very well delineated as the dogs are steering and directing the team and sled along the route;